

The Useful Soybean

A Plus Factor in Modern Living

by MILDRED LAGER

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M c G R A W - H I L L B O O K C O M P A N Y , I N C .

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THE USEFUL SOYBEAN

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DEDICATED

*to the men and women who have
pioneered in the development
of the soybean*

Preface

THE history of the soybean is a fascinating story of a little round bean that has literally been a golden nugget to the Oriental world. Soybeans are perhaps the world's oldest food crop, and for centuries nutritionally they have meant meat, milk, cheese, bread, and oil to the people of Asia. Economically they have meant gold, a cash crop, something to sell or to exchange for other necessities.

We of the Occidental world are just discovering that soybeans are indeed nuggets of gold in our modern civilization. During the last twenty-five years, they have mushroomed from an almost unknown forage crop to one of our important cash crops, vital in the fields of agriculture, commerce, nutrition, and industry. Nutritionally soybeans became a vital food for a world at war and a postwar world at peace. Industrially they are a challenge to the chemists' flasks and test tubes; for more than two hundred commercial products are being made from the little beans. Hence soybeans and soybean products are indeed destined to be a vital plus factor in our world of tomorrow.

Food has always been my hobby. When Fate, that unseen hand that sometimes guides us to our rightful groove in life, gave me firsthand experience with the miracles of proper diet, teaching fundamental facts on nutrition became my goal. I have tried to pass on the message of better eating via the platform, the printed page, and the radio, and for the last dozen years have enjoyed the unusual opportunity of occupying a vantage point on a busy crossroad of nutrition. I have seen, too, the value of soybeans in the so-called "corrective regime," and it has convinced me of their rightful place in the average diet.

I experimented with soy as a food, secured various soy products for special diets, made up recipes, and in my classes taught the

use and cooking of soybeans when they were practically unknown, when soy was eaten because it was soy and regardless of taste or palatability. In 1942, when soybeans became prominent as a war emergency food, a collection of these recipes was published under the title of "150 Ways to Use Soybeans."

We of the Western Hemisphere know little of soybeans. We have not had to use them as a food, we are not acquainted with their nutritional merits, and we have not acquired a taste for their flavor. War and progress, however, bring great changes, and from now on the soybean will be an important food in America. It came into the limelight as an emergency food—a protein-replacement food—and it will remain there as a *plus element in our nutrition*. Our great problem is that we need to know the value of soybeans and how to use them as a nutritious food. Our great advantage is that we need not rely upon the bean in its original form, because research has given us palatable soy products to meet every need, *taste*, and pocketbook.

Because my main interest in soybeans and soy products is nutritional, the purpose of this book is to help bridge the gap from the unusual to the usual. I have tried to present the story of Asia's ancient food in a true, authentic manner—to give credit where credit is due. I am not a vegetarian, not affiliated with any organization or group advocating a meatless diet. I believe that proper nutrition and common-sense living are man's best medicine.

Because we are more interested in things when we know something of their background, I have given the history and the romance of the beans as well as their uses and recipes. I have tried to omit heavy, tiresome facts and figures and have included only those that are necessary to prove commercial and nutritional values.

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PREFACE

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Maren Elwood, Hollywood, Calif. (for her help in editing the manuscript).

Ellender McGraw, my secretary.

MILDRED LAGER.

LOS ANGELES,

March, 1945.

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Chapter

Agriculture's Cinderella

OUT of the dim and misty past, a little round bean rolls forth to play a spectacular and gigantic role in our agriculture, commerce, industry, and nutrition. It is a seasoned actor and for centuries has had an important role in the world drama of war and peace. Insignificant in appearance, dramatic in performance, the soybean has influenced the fate of nations. It has saved the Oriental world from starvation, become monarch of Manchuria, a secret weapon of Germany, a friend of the Allies, a plus factor in American nutrition, and a solution to the food crisis of the war-torn nations of the world.

AMERICA DISCOVERS THE SOYBEAN

The soybean is a bean with a past, present, and future—a vital present and a tremendous future. Yet, the average American knows very little about it; in fact, he hardly knows what it looks like. He has not been interested in a bean raised for cattle food, hay, or soil improvement. He has never dreamed that one day the humble soybean would be classed as one of the five great protein foods, and that its bodybuilding and life-sustaining powers would be recognized along with those of meat, milk, eggs, and cheese. Neither has he realized that soybeans could be made into flour, flakes, grits, and a host of other products that can be added to everyday foods without his being aware of their presence.

The soybean came to this country as a stray immigrant about 1804. It took us over a hundred years to realize its value. Up to twenty-five years ago, soy pioneers who saw commercial, industrial, and nutritional possibilities in the bean were classed as fanatics. As far as the general public was concerned, the Chinese bean did not register at all. Even growers saw it only as a hay crop, a cattle food, or a soil improver. Industrial uses were merely dim possibilities, and its nutritional merits were left entirely to food-minded individuals and the so-called "food cranks."

The First World War gave soy its first real chance. Fats and oils are precious in wartime and, because the soybean contains 18 per cent or more of oil that can be used for industrial and edible purposes, it became important as an oil crop. The result was that soybean oil entered the American kitchen as a refined oil for salad dressings and shortenings. During the First World War, we also became aware of the nutritional value of the bean for army rations and as a human food, but nothing further was done about it at the time. Bill Baker, of Ojai, Calif., one of the early pioneers of soy bread (see Chap. V, page 91), used to say, "The First World War discovered the value of the soybean and the Second World War will put it where it belongs."

Nutritionally the Second World War put the soybean in its rightful place. It is no longer considered a diet food, a fad, or a substitute, but it is now a food that can stand on its own merits. The global conflict has thrust soy into our diet, and soy will leave a lasting imprint.

It does not necessarily mean that we shall all welcome soybeans and soy products with open arms, or that we shall prefer them to animal proteins, or that we can live on soy alone—not at all. The American people will continue to draw their major foods from meat, milk, eggs, and cheese. The soybean, however, can supplement these foods and can if necessary make the transfer from a high-animal-protein diet nutritionally safe and appetizingly delicious. Soybeans in the form of soy flour or grits are a protective element, a means of fortifying our diet and of making good foods better.

We are going to meet soy in every form imaginable—as a dry bean or a tender sprout, and in everything from appetizers to chocolate sodas. We might expect soybeans in soy bread, soy

cereal, or crackers, but hardly in lunch meats, pretzels, ice cream, candy, or chocolate. Yet chances are it will be there in some form or other, and we shall never know the difference in taste.

OUR WONDER BEANS

Nutrition is the last milestone for the soybean. Long ago it proved its value as one of our best animal foods. Before it lies still another field, that of industry, and here it justly earns its title of wonder or miracle bean (see Chap. III).

The soybean began its industrial career shortly after the First World War, and this career will be renewed on a large scale after the present conflict. Scientists admit that we have scratched only the surface of the possibilities of the test tube and that many of our test-tube products must come from agriculture. The versatile soybean in the hands of science gives us lubricants for our war machines, nitroglycerin for our bombs, synthetic rubber, paint, linoleum, glue, ink, plastics, fountain pens, vitamin B₁, and more products in a list that consists of some two hundred commercial products. On top of that, the soybean is a nearly perfect food (see Chap. III, page 31).

The hay-to-hairpin ability of the little bean has been the source of many a fantastic tale for the postwar era, and it is perfectly possible that we shall be wearing soybeans—Henry Ford already has a suit of soybean wool—riding in soybeans, and reading books in which soybeans are used in inks and paper coatings, as well as eating soybeans (see Chaps. III and X). As yet, the industrial world has used very little of our soy crop; 95 per cent of the meal has been consumed by American cattle, and 80 to 85 per cent of all the oil has been used for edible purposes. At present, the War Production Board has restricted soy production almost entirely to food uses. This leaves the industrial field as a challenge to postwar America, and there is little doubt that the soybean will come through with flying colors.

SOY AS A FOOD IN THE UNITED STATES

Proper nutrition is a much used term today, yet recent surveys show that only one-half of the adults of the American population have learned that there is a close connection between diet and health. We cannot build sturdy bodies without proper material, and that material must come from the food we eat.

We pride ourselves on being the best fed nation in the world. Hence it was a decided jolt to our pride to learn that malnutrition had threatened thousands with starvation in the midst of plenty. *It is an established fact that the American diet is lacking in the protective elements*, in the real essentials, and that "hidden hungers" menace a good share of our population. One blessing that has come out of the war is the awakening to the fact that what we eat does make a difference. Fortunately we are becoming vitamin- and mineral-conscious, but so far we are more conscious of the vitamins and minerals in bottles on the druggist's shelf than of those in our God-given natural foods. Unrefined foods also contain the trace elements and unknown vitamins and factors that science has not as yet discovered.

Illness hinders all effort. Millions of man-days of labor are lost to industry every year because of everyday illnesses. Industrial plants are now trying to teach their workers that proper foods build physical fitness and cut absenteeism. They have found that proper nutrition means increased efficiency and production. It is therefore no wonder that lunchrooms and cafeterias where balanced lunches can be secured are being installed in many plants. Stressing the value of a good breakfast and teaching the packing of a proper lunch also are part of industry's nutritional program.

Henry Borsook, professor of biochemistry, California Institute of Technology, has made several interesting dietary surveys of industry. A survey of one of the large airplane plants in southern California reveals some interesting facts on the diet of the worker and the need of nutritional education. Of 12,000 persons actively engaged in war work

65 per cent had one serving of meat, fish, or fowl daily.

4 per cent had less than one serving every other day.

72 per cent ate a sufficient number of eggs; 10 per cent had no eggs in 5 days.

60 per cent had some form of whole wheat daily.

60 per cent ate potatoes every day.

67 per cent used less than 1 pint of milk daily; 26 per cent had no milk at all; 20 per cent had less than one glass, and 21 per cent had less than two glasses.

22 per cent ate no green leafy vegetables.

62 per cent ate less than one serving of green leafy vegetables every day.

40 per cent ate no carrots at all.

4 per cent ate sweet potatoes once a week.

24 per cent used no citrus fruit at all; 40 per cent had only 1 ounce daily; and 18 per cent had 2 ounces.

54 per cent used no tomato juice.

Optimum health cannot be built or maintained on such a diet.

The average fountain or lunch counter discloses worse nutritional errors. Here too many persons rely on coffee and toast, or coffee and a sweet roll for breakfast, a sandwich or piece of pie for lunch, and perhaps a spaghetti entree for dinner. Meals like these do not contain enough of the essential proteins, vitamins, and minerals that are absolutely necessary to build and maintain healthy tissue. Nutritional errors of this kind are causing malnutrition in our land of plenty and are making the sale of vitamins and food supplements soar into the class of big business.

There is an immediate connection between diet and health. Ignorance is not bliss when it comes to eating, and only lately have we regarded nutrition as a means of getting well and staying well. It is a proved fact that proper food increases human stature, builds resistance to disease, lengthens the span of life, and increases mental alertness (see Chap. VII, page 118). We have refined, processed, and destroyed our natural foods until they are merely calories minus the essential elements, and then we have tried drugs to overcome the deficiencies developed from the wrong kinds of food. We have made our tables groan with delicacies from the four corners of the world and have made gastronomical errors of our meals; yet we have wondered why the stomach gets tired or the liver balky. Proper nutrition is only common sense. Natural protective foods are our best medicine and, when combined with sensible healthy daily habits of life, are the true secret of physical fitness. Eating proper natural foods is the ounce of prevention that is worth more than a pound of cure.

America needs nutritional education, and it is a problem every community must meet. A. J. Lorenz, chairman of the Food and Nutrition Commission of the State War Council of California,

says that he finds too many school cafeterias serving as many as seven kinds of pie, with little fruit or brown bread, industrial plants supplying canteen service of soft drinks and no milk, and too many young people going to school or work without breakfast. Mr. Lorenz and his commission would have nutrition a required course in every high school and would have every teacher trained in fundamental food facts. Health, like charity, begins at home. Vitality through nutrition must become the goal of future America.

How can soy enter this picture? It can fortify our everyday foods with extra proteins and with the natural vitamins and minerals it contains. Soy flour has been called the food of the future and is the means of raising the nutritional value of our everyday foods. For instance, 2 pounds of low-fat soy flour equals, in protein value, 5 pounds of boneless meat, 15 quarts of milk, 6 dozen eggs, or 4 pounds of cheese. A small amount of soy flour added to our bread, bakery goods, and paste products will raise the protein content amazingly (see Chap. IV, page 67).

When bread is enriched, it is still as deficient in protein value as it was before enrichment, but the addition of soy flour can increase the growth-promoting value of white flour three- or fourfold, with eight vitamins and twelve mineral elements thrown in for good measure (see Chap. IV, pages 68, 71).

Soy foods, especially soy flour and grits, are high in nutritive value, abundant in supply, and low in cost. They are the means of making the low-cost diet nutritionally safe. In the words of Donald S. Payne, chief of the Soya Products Section of the Food Distribution Administration, "Soya is a low-cost, abundantly available, highly nutritious food ready to throw into the breach in the event of an economic collapse. People went hungry during the last depression not because they didn't have a nickel but because they did not have a dollar. Development of the soya food industry means hedging our country against a collapse in health."

SOY IN REHABILITATION FOOD PROGRAMS

One of the first problems to be conquered in the rehabilitation of occupied nations is that of hunger and malnutrition. The great need of these war-torn countries is protein, because most of their animal population has been destroyed. In other words, they need meat, eggs, milk, and other animal products. This,

however, presents a problem; for not only are animal proteins perishable and expensive, but we do not have enough of these kinds of foods to take care of our own needs and also supply a good share of the world. As a result, we must turn to vegetable forms of protein. Again the burden falls on the little soybean with its abundant supply of highly nutritious protein, which is low in cost and easy to ship and does not require refrigeration.

According to the Soy Flour Association, soy protein included in small percentages with other foods is a guarantee that no part of protein rehabilitation foods be wasted. The addition of soy—5, 10, or 15 per cent—to practically any or every food will bring about little or no change in flavor and yet will increase the protein intake greatly. Soy can be premixed with other foods for high-protein cereals, soups, vegetable stews, spaghetti, and the like. This has been done, and such products, through Lend-Lease, have meant the saving of stricken nations (see Chap. II).

Soy will no doubt be doing its biggest job in Lend-Lease and in the feeding of malnourished peoples. Once again it proves to be the staff of life not only for China but for the entire world.

SOYBEANS AN EMERGENCY CROP

Soybeans are one of our best resource crops, one that can and will supply food needs in an emergency with the least amount of time, labor, and money. In an emergency, grain crops must be stretched to the last ounce by feeding them directly to the people instead of to livestock to be converted into meat, milk, or eggs. For instance, the average hog takes 7 pounds of corn to produce 1 pound of table pork.

But there is a grave danger in shifting from a meat to a large grain diet in that grains do not contain enough nutritive proteins (see Chap. IV, page 51). In other words, the question of protein in nutrition is essentially a question of amino acid requirements, and grains are not complete in this respect. That is the reason that bread, crackers, and paste products can never take the place of meat, milk, eggs, or cheese in the diet. This does not mean, however, that grains are not valuable. They are valuable, but *their protein deficiencies must be corrected* by other foods containing an abundance of the essential amino acids. The soybean is our best protein food from the vegetable kingdom and the only

vegetable food that contains sufficient nutritive proteins to take the place of meat in the diet if necessary (see Chap. IV, page 51). It contains essential amino acids to sustain life for an extended period of time; hence it fills a need in the balanced diet that grain alone does not.

Table I from "Using Resources to Meet Food Needs" by Raymond P. Christensen, Bureau of Agricultural Economics, U.S. Department of Agriculture, Washington, D.C., shows the average output of protein per acre of land and 100 hours of labor. (The June, 1943, issue of *Fortune Magazine* contains an interesting illustrated article based on facts from this survey.)

Table I.—Average Output of Protein per Unit of Resources

Products	Pounds per acre of land	Pounds per 100 hr. of labor
Milk, whole.....	39	89
Chickens.....	25	74
Eggs.....	26	56
Hogs.....	18	58
Beef cattle.....	7	45
Wheat, whole flour	90	1,002
Wheat, white flour.	56	621
Corn, corn meal...	57	211
Potatoes.....	118	174
Dry beans.....	150	576
Peanuts.....	116	200
Soybeans.....	339	2,821
Carrots.....	166	51
Grapes.....	57	31

Note that 100 hours of labor will produce only 45 pounds of protein from beef cattle, against 2,821 pounds from soybeans. Whole wheat ranks next with 1,002 pounds from 100 hours of labor. If man's approximate yearly need of protein is 53 pounds, this amount can be secured from soybeans in only 2 hours of labor. *Fortune Magazine*, June, 1943, states that 1 man-hour of farm work devoted to raising soybeans will produce more than forty times the energy food values as the same amount of work applied to raising eggs. In terms of acreage, 1 acre cropped for soybeans produces as many calories as 11 acres devoted to hen feed for eggs.

In days when seconds count, the rapid maturing of soybeans and whole wheat makes them valuable emergency crops. We not only get 339 pounds of protein per acre from soybeans against 7 pounds from beef cattle, but we have a mature crop of protein practically equal to that of beef in 90 to 100 days against 3 years for prime steer beef and 14 to 18 months for baby beef.

A 50-acre field in Iowa, Illinois, Indiana, or Ohio, for instance, will produce approximately 1,000 bushels of soybeans. This means about 9,000 pounds of crude soybean oil and just a little less than 25 tons of high-protein soybean oil meal. The oil is raw material from which 10,500 pounds of margarine, 8,400 pounds of shortening, or the same amount of salad oil can be made. This salad oil can produce from 6 to 12 tons of salad dressing, depending on the variety. This same 50-acre field also produces 48,000 pounds of high-protein soy flour or grits to feed the hungry peoples of the world or 24 tons of high-protein oil meal for animals. When skillfully blended with other concentrates and carbohydrates, this amount will stretch ten times and be feed to produce more beef, pork, milk, poultry, and eggs.

Thomas Jefferson probably did not have the soybean in mind when he said, "The greatest service which can be rendered any country is to add a useful plant to its culture, especially a bread grain; next in value to bread is oil." He might just as well have been speaking of soybeans, however, for they contain both bread and oil, and it is little wonder that they have climbed to the distinction of being a vital crop not only to America but to the world.

SOYBEAN TERMINOLOGY

So far, there has been a certain confusion regarding various terms for soybeans, and this is to be expected in a new industry as new products and new situations develop. For example, the average individual does not know if he should write soybeans as one or two words or if he should say soya or soyabean. A variety of terms have been used by the U.S. Department of Agriculture, but the National Soybean Processors Association and the Soy Flour Association have adopted their own standard of usage for the trade. Members of the industry have tried to establish some uniformity of soybean terms, and the following are generally accepted:

First of all, it is soybean, not soy bean or soya bean. Other terms generally fall into two classes, one pertaining to food products for human consumption and the other for animal feeds and industrial purposes. The food concerns feel that the word soybean brings associations of livestock feeds, and it therefore prefers to drop the word bean in connection with soy foods. We, therefore, say, soy flour, soy grits, soy milk, soy oil, soy sprouts, etc., when referring to edible soy foods. The U.S. Department of Agriculture prefers "soya" as a food term and talks of soya flour and soya grits. The Soy Flour Association uses both "soy" and "soya." "Soy," however, seems to be gaining in favor because it is shorter, easier, and sounds more American and less affected.

In the terms of feed and industry, the word "soybean" is used and not bean meal, oil meal, or bean oil. The crusher, miller, presser, etc., is now called a soybean processor, and the farmer has become a soybean grower. These are only general terms today and may vary as the industry grows and new products are developed.

America has indeed discovered the soybean. Our Oriental immigrant is now an important citizen, one whose voice will be heard and whose influence will mean better nutrition and better living.

Chapter II

World-wide Use of Soybeans

WE DO not appreciate an antique until we know something of its history, its age, or the value someone else places on it. Most of us have had the experience of coming out of an antique shop with a high regard for grandmother's chipped cup that we have been threatening to discard or for the old-fashioned deep bowl that has been retired to the garage as a catchall. Let anything smack of an antique, and it immediately comes out of the discard and is restored to its rightful place among the family heirlooms.

A REAL ANTIQUE

In the same way, we shall perhaps have a higher regard for the soybean when we realize that it is a rare antique, steeped in the romance of the past and glowing with the vital possibilities of the future. It is no longer just a bean grown in China since ancient times but is a vital factor in modern civilization, destined to be important in the war and in the postwar world. It is an antique with a future. The average person's knowledge of soybeans, if he knows anything about them at all, is limited to what he has recently read. He is likely to think of them as a hobby of Henry Ford's or to believe them to be a new wonder bean of America. Banner headlines have described a miracle bean, have suggested soybeans for food, clothing, shelter, rubber,

or nitroglycerin—yes, literally all that, because the soybean is vital as food and also vital to the war and to industry.

Soybeans are ages old. We have no record of their beginning as a basic food; they are one of the world's oldest crops and were in cultivation centuries before the building of the Pyramids. They have been one of the five sacred grains of China—essential to the existence of the Chinese civilization, extolled by the poets, and sown with the blessings of the emperors.

Many myths in both Chinese and Japanese folklore deal with the origin of the little bean and have lived through the ages to add a touch of mystery and romance.

In Japanese mythology, it is believed that Izanagi was sent down from the high heavens to create the islands of Japan. He also peopled them with earthly gods and goddesses. The last three he created pleased him so much that he made one the goddess of the sun, another the god of the moon, and the third the god of the sea. But this last god, Susanoo, did not care for his watery kingdom and refused to live beneath the waves. He was not only ungrateful but troublesome as well, and Izanagi finally disowned him. Susanoo then became a wanderer and an outcast. One day, hungry and weak for lack of nourishment, he appealed to the goddess of food for something to eat. She gave him what she had, but it displeased him. In his rage he killed her and buried her body in the ground. Immediately five food plants sprang up to feed the people—first, the soybean, then the large bean, rice, millet, and barley. From then on, the five supplied the Japanese kingdom with nourishing food. To the Japanese we also attribute the saying, "When you grow soya, you grow meat, milk, and eggs."

The Chinese legendary version is that, when Hou Tsi, one of the gods of agriculture, wished to give his people a superior food, he planted soybeans. These plants thrived, and their crop fed the entire Oriental world for thousands of years.

The Chinese story of the "staff of life" is a convincing tale of a caravan of Chinese merchants traveling north from their own city laden with a magnificent and valuable cargo of gold, silver, jewels, and furs. One evening at sundown, they were suddenly and fiercely attacked by bandits. In order to escape capture, they fled to the rocky highlands. Here they defended themselves as best they could against their assailants, but after a time

their food supplies became exhausted. Weakened for want of nourishment, they saw before them surrender and confiscation of their valuable goods.

Then one of the servants discovered a small vine that bore a hairy little bean. For want of other food, he gathered the beans, ground them into coarse meal, and made little cakes. These cakes proved a miracle food, sustaining the entire caravan and enabling them to hold off the enemy until help arrived. From then on, soybeans became the staff of life of China.

The soybean has truly been a necessity to China and Japan. The whole Oriental world could not have existed without it. It has been their major source of meat, milk, bread, cheese, and oil. It has been called the poor man's meat, but few of the millions who used it could explain why this was so. The coolie only knew that, without his soy cake, or soybeans in some form, he began to feel weak, fatigued, or exhausted.

Our own recent knowledge in the science of nutrition tells us that such exhaustion is due to the lack of sufficient amounts of complete proteins. China, Japan, Manchuria, and the surrounding countries are heavily populated; their standards of diet are low; it is impossible for them to have the meat, milk, and eggs of the Western world. Their main foods are rice and cereals, which of themselves do not have enough proteins and protective elements to build and maintain optimum health. Hence the soybean with its rich source of nutritious protein has been the secret of the centuries, the poor man's meat of the Oriental countries. It has saved that part of the world from starvation. Furthermore, it has been estimated that soybeans furnish the source of protein for more than half the people of the world.

It is only natural that soybeans are steeped in superstition as well as in legend. In China, the person who wears a string of them concealed about his neck draws unto himself magic powers and the ability to perform weird and mysterious feats. If three dark beans, so the story goes, are soaked in sesame oil for three days, they can foretell the future as clearly as any famed crystal ball.

And so one of our oldest food crops is shrouded in mystery. We do not know where it came from, who sowed the seeds, or how it got its name. The first written mention of the soybean was in a *materia medica* describing the plants of China by

Emperor Sheng Nung in 2838 B.C. Being a sacred food of China, the seeds were sown early in the season with great ceremony.

Soybeans belong to the pulse family with the broad bean, lentils, and peas, and their botanical name today is *Glycine hispida* or *Glycine soja* or *Glycine max*. In early history, the Chinese called them "Shi-yu" and "Ta-tou." The Japanese named them "Soja," after "Suju," a dark rich sauce made from the bean.

The first botanist to make a study of leguminous plants was Linnaeus, and in 1737 he called the soybean *Phaseolus max*, linking it with the American kidney bean. Several years later, Moench, a German botanist, thought the bean of enough importance to warrant a genus of its own, and he called it "Soja" from the Japanese *Suju*. This name, *Soja max*, was accepted for nearly half a century. Later, two more German botanists had a hand in renaming it, and it became *Glycine*. Whether it is *Glycine hispida*, *max*, or *soja*, no one knows; and it makes no difference, for each authority clings to the name he prefers.

It was thousands of years before the beans found their way from the Orient to Europe and America. Engelbert Kaempfer, a German botanist, spent two years, 1691 to 1692, in Japan and was the first to introduce the seeds to Europe. In 1740, they were growing in the botanical gardens in France; in 1790, in the Royal Botanical Gardens of Kew, England. Apparently, no effort was made toward their culture as a crop. They were a curiosity.

However, in 1875, Friedrich Haberlandt, of Vienna, became enthusiastic about soybeans and published his investigations at length. Although the beans were raised more extensively because of his work, they did not attain the place in European agriculture that he had hoped for. Ever since the work of Haberlandt, soybeans have been grown experimentally in most of the European countries, but all climates are not exactly suited to their culture. They grow very well in certain parts of Europe, especially in the Balkans. The German invasion of this territory gave her a rich soybean-growing area (see page 18).

Somehow, soybeans found their way to the New World, and our reception of them was not any more enthusiastic than that of Europe. During the past decade, however, theirs has been a

true Jack and the Beanstalk story, and their dizzy rise has been one of the most amazing of any industry (Chap. VII).

The most popular story of the soy immigration is that they were brought to America quite by accident. A Yankee clipper was cruising the Chinese ports in search of a cargo. The captain did not know how long his journey would be and threw in several sacks of soybeans as a reserve food supply.

Another version of the introduction of the soybean into this country is that an American missionary in the Orient thought that it should have a place in our diet and sent a package of seeds to a friend in New England. The first mention of them in American literature was in 1804, when James Mease wrote, "The soybean is adapted to Pennsylvania, and should be cultivated." For many years, however, the beans remained a botanical curiosity and were exhibited as such even as late as 1893, at the World's Fair in Chicago.

Regardless of how soybeans were introduced to America, Virginia seems to have been the first state to adopt them for hay and feed. For almost a century, she was the leading state in soybean cultivation and her climate was considered among the best adapted to the crop. Ninety years after their introduction to this country, the beans were planted by a farmer near Jacksonville, Ill., in about 1897. Much to the surprise of the Illinois farmers, the beans grew better and produced higher yields in the corn belt than in Virginia, and today Illinois is the largest producer, and Virginia ranks eleventh.

There is no doubt that the soybean is a real antique, but only now, as the result of scientific research, do we realize the tremendous value of soy nutritionally, economically, and industrially to a new streamlined world.

MONARCH OF MANCHURIA

Manchuria is the best example of what the soybean can mean to a nation. It *alone* is sufficient to guarantee that Japan can never be starved out of Manchuria by blockade. As food for man and beast, as fertilizer, and as raw material for industry, the soybean has proved more valuable to Manchuria than her rich mines and forests. Bean cakes and bean oil have for many years, in normal times, furnished more than half of her exports. The soybean has become the dominant industry of Manchuria.

The Japanese have long been fully aware of the vast possibilities of this industry. In 1940, they made it a state monopoly, and since then they have done everything scientifically possible to promote and increase the growth of the beans and to explore other fields for their commercial use. The Japanese intend to make a good thing better and have honored the lowly bean with hours of painstaking labor and experiment. Japanese scientists have not only made a careful study of the seeds, the soil, and the culture, but they are constantly developing new products from the beans. Before the Second World War, a laboratory in Dairen maintained a permanent soy exhibit to show what could be done. Twin bottles of beans told the story of before and after improvement.

An amazing array of objects showed the many possible uses of the beans. They fed not only the Nipponese people and cattle but also their war machines. Soy was used in explosives, lubricating oils, and plastics; in soups, salads, and vitamins. Automobile steering wheels were once in part soybeans as were buttons, fountain pens, paints, inks, and floor and roof coverings. In the hands of the Japanese chemist, the beans were made to yield sugar, rubber, or wool. Huge cartwheel bean cakes, so familiar on the docks of Dairen, were used for cattle feed and also gave Japan's weary soil a transfusion.

Soybeans, a native food for the Japanese, would naturally be a part of their army rations. And the Japanese are also using it in forms not yet undertaken by the Germans or the Allies. Studies of captured Japanese army rations made by the Board of Economic Warfare showed that the Japanese soldier in the field eats a highly nutritious, scientifically balanced diet particularly well adapted to his special needs and considerably better than the customary diet of the Japanese civilian. Food items tested include the standard ration biscuit, a health drink called "Mirin" containing lactic acid, a yeast preparation called "Florylin," wheat-germ tablets, and a tinned ration labeled "rice and soybean curd."

Rice and soybean curd is a mixture of cooked rice and soybean protein flavored with soya sauce. The army ration thus offers an excellent combination of carbohydrate and protein. It is, in fact, a sort of cooked sandwich, in which boiled rice takes the place of bread and the soybean curd or protein takes the place of meat.

What the Japanese scientists have done we can do and outdo. American research on soybeans in the last few months has been both rapid and intensively thorough. It is now a recognized fact that the soybean will also play a leading role in our streamlined living.

SOYBEANS IN MECHANIZED WARFARE—GERMANY

Our enemies awoke to the worth of soybeans in meeting a tight food situation long before we did. Germany fully realized their value. In her methodical and scientific way, in 1938, she issued a cookbook containing more than two hundred and fifty soy recipes. She saw in the soybean a food high in good-quality protein that was a valuable substitute for meat, was rich in fats and energy value, and had an appreciable amount of certain members of the vitamin B complex. It was something that would make an ideal army as well as civilian food, and no time was lost in securing a source of supply and in teaching the people how to prepare and use the beans.

Even we felt the effects of this program. The growing and processing of soybeans under German control made serious inroads on the American exports of lard to Europe, for German chemists soon perfected an odorless, colorless solidified soy oil product that replaced lard at 50 per cent of its cost.

Germany learned many lessons from the First World War, among them the great importance of food supplies for the civilian population. In 1914, she thought her race through France would be rapid and victorious, so little thought was given to the problem of food for civilians. But the English blockade found them unprepared for a long war. As a result, the German population suffered untold agonies, not only from actual starvation but from malnutrition. In the thirties, Germany was not going to let this happen again! The stage for the Second World War was set with ruthless efficiency. This time the food campaigns were as carefully planned as the military campaigns. Long before the declaration of war, civilian rations were reduced to a war basis. But Nazi Germany made sure that this basic ration contained all that was required for adequate nutrition and that it was available for everyone—citizen and soldier alike. The food experiences of the last war were not to be repeated.

The Second World War found Germany with full granaries. Her 1938 to 1939 crops had been very good, and she had carefully stored the surplus. When her granaries were full, and more space was needed, she requisitioned ballrooms and schoolrooms and filled them with grain. Tons of soybeans were imported from Russia before the outbreak of hostilities between the two nations. It is estimated that Germany at the beginning of the war had enough grain to feed her nation for a year and that she had laid in a store of two million tons of soybeans. The German soy reserve represented the equivalent of animal protein for the whole population for five months.

There is little doubt that the control of soybean production in Europe by Germany was deliberately fostered by Hitler in his plans for world domination. In soy he saw a vital sinew for total war. Realizing that importation of soybeans would be liable to interruption by blockade in wartime, the German government took steps to develop the growing of the beans in the Balkan countries. The notorious I. G. Farben industrial group, with full support and encouragement of the Reich, promoted and subsidized the growing of soybeans in Rumania, Austria, and all the Balkan states. They rapidly became a potent factor in the agricultural economy of those countries, and Germany was able to reduce its importation of soybeans from Russia 75 per cent.

Great advances have been made in food concentration during the last few years. Today concentrated rations are a standard part of military equipment. They help to solve one of the Army's major problems, that of transportation and preparation of food for rapidly moving troops. Concentrates will be equally important in the mass feeding of a malnourished world during occupation and after the peace.

The German high command has been ahead of the Allies; concentrated rations were issued to German troops as early as 1930. Shortly after Hitler came into power, a dietary revolution took place in Germany, and every item was designed to meet conditions of rapid mechanized warfare. The Nazi nutritional front is nothing miraculous or original, but it does represent long research, careful planning, and a huge personnel of nutritionists, physicians, biochemists, and technical experts of all kinds. The new regime has transformed the whole German food economy.

It claims to have lowered the cost of balanced meals in Germany 25 to 50 per cent. The soybean has been a big factor in this change and has fulfilled the prophecy of Fürstenberg, their scientist, who in 1917 had visions of the bean as "the plant that is going to revolutionize the nutrition of humanity."

The diet of the German Army up to 1935 contained the usual meat, sausage, and hardtack. But in 1936, reports began to trickle out about the "Nazi food pills" and the antifatigue rations used by soldiers on the march. Ultimately, samples found their way to this side of the world. The mysterious food pills were found to be in the form of biscuits, efficient even if they were crude and unpalatable. The biscuits were oblong in shape, approximately 3 by 2 inches, and $\frac{1}{4}$ inch thick. In each pound, they contained roughly 200 grams of carbohydrate, 100 grams each of fat and proteins, with a moisture content of about 10 per cent. The caloric value was around 1,500 calories. In appearance, they were somewhat similar to Scotch oatcakes. In taste, they were dry and unappetizing, but the physical conditions of the German soldiers, especially in the early days of the advance into Poland, left little doubt of the efficiency of the Nazi nutritional front.

Germany, by the use of powdered and concentrated foods, has formulated these carefully balanced rations and fortified them with additional vitamins. The nutritional value of soybeans, especially soy flour, makes them a natural concentrated food, and it is not surprising that they form so important a part in the German soldier's ration. Germany frankly claims that her advance into Poland could not have been so rapid had it not been for soy. The German staff had built a Blitz army, mechanically equipped to strike paralyzing blows and move with amazing speed. They had also built Blitz rations with maximum nourishment and minimum problems of transportation. The German soldier can carry a 3 days' supply on the march, and reserve supplies are easy to bring up. It is doubly interesting to note that a German report at this time said that the emergency ration had proved a factor in the prevention of rheumatism and trench fever.

The *London Times* of Apr. 23, 1940, said, "The soya has become vitally important to Germany from the food, the economic, and the military standpoints." But the German food

experts and chemists were not through experimenting. The German air ministry made a "quick energy builder" from grape sugar, cocoa, soybeans, and meat extract. This was used by aviators after long flights or when they were suffering from nervous exhaustion. This "builder" proved of such value that the next step was "Edelsoya," a soybean flour containing the proper proportions of protein, fat, and carbohydrates. This served as a substitute food for the Army. The Germans found soy flour almost a packaged meal made by nature for a soldier's ration. Full-fat soy flour has been the secret of the so-called "Nazi food pills." It is the antifatigue food used by the German soldiers on all fronts.

Soy flour is basically a protein food. It is described as "having everything"—palatability, high digestibility, concentrated form, low cost, easy storage, low transportation weight, stability, little or no spoilage risk, and no special treatment required for eating.

A Berlin report points out that 1 pound of this soy flour is equivalent in protein to $2\frac{1}{2}$ pounds of beef or 54 eggs or nearly 8 quarts of whole milk (see Chap. IV, page 53). In addition, the German army's preference for soy flour is based not only on its nutritional values, but also on its low water content and extraordinary keeping qualities. A low-fat soy flour will keep 2 or 3 years without turning rancid or otherwise deteriorating. Its low cost is another advantage. One pound of soy flour costs only as much as 4 to 5 ounces of meat, while the nutritive value is equal to $2\frac{1}{2}$ pounds of meat. A soldier can easily carry a 3-day supply in his knapsack, and additional supplies are more easily transportable and storable than animal foods or the bulky tinned meats and sausage emergency rations of the last war.

Thus we clearly see that soy flour is not an ersatz for Germany and not a food pill, but a new and superior foodstuff that can solve one of that nation's greatest weaknesses, the lack of foodstuffs of animal origin, namely, meat, milk, and eggs. Soy is an army ration as revolutionary as mechanized warfare.

SOYBEANS IN OTHER COUNTRIES

The value of soybeans in the human diet, particularly under wartime conditions, became apparent to the Western world during the Russo-Japanese War of 1904 to 1905. Reports of the

amazing stamina of the Japanese soldiers reached Moscow, and investigation revealed that soy was the main ingredient in their rations. The result was intensive research on the growing and processing of soybeans in Russia.

A soybean institute was organized in Moscow, and before long the beans became a staple food in the peasant districts. During the revolutionary time, the soybean was known in Russia as "our young Chinese ally." Today we can call it the American ally. James L. Doig, of the Floya Milling Company, Montreal, Canada, points out that, in addition to soy flour now being sent to Russia under Lend-Lease, they are also sending a mixture of soybean meal, oatmeal, and salt. This is shipped to the Russian Army headquarters and is used as a quick-cooking porridge for troops in the field. Reports are that it is very popular.

Through her association with Germany, Italy was able to import quantities of soybean flour. Mussolini saw the value of soy to his people and in 1938 ordered that all bread baked in Italy must be fortified with substantial percentages of soy flour.

Spain profited by German-Italian aid, and large quantities of soybean flour were shipped to Franco as emergency rations for his troops.

Belgium, Holland, Norway, Denmark, and Sweden began to use soy flour and soy oil in baked goods, confectionary, and the like. Most of their imports came from Great Britain, who in turn imported the beans from China and the United States and processed them in various plants scattered throughout England.

Great Britain has long realized the value of soy, and the government has endeavored to foster its growth. Climatic conditions are not favorable, however, for crop production in any quantity, and the British Isles have had to rely on imports for their soy supply. They do have plants to process the beans into flour, oil, and meal. Lend-Lease has made possible huge shipments of soybeans and soy products to Great Britain. They favor the use of soy and welcome it as a means of securing adequate nutrition for both civilian population and the armed forces. It has been used extensively in meat products, bread, and bakery products.

The Canadian navy is using what they call a "life-raft ration" made by the Floya Milling Company, at Montreal. This is

far superior to the early German biscuits in every way. It not only looks better and tastes better but contains more calories; more protein, carbohydrates, and fat; less moisture; and added vitamins and balanced minerals.

It sounds quite simple to make a formula for concentrated food. We know the calorie needs, the balance of carbohydrates, fats, proteins, minerals, and essential vitamins. But to get all this into a small good-tasting wafer is quite another matter. The Canadian government wanted the biscuit to be more than a concentrated food; it must be a completely balanced ration, palatable, requiring only water to provide adequate nourishment, and containing the roughages required for normal elimination. Carbohydrates and fats presented no difficulty, but the source of a complete protein was a real problem. Many sources, including dried meats, were tested and abandoned for various reasons. Finally soy flour was tried. The ordinary soy flour proved unsuitable, but a specially processed soy flour was found to be just right.

A special grade of shortening was used to ensure keeping qualities, and the salt intake was kept low because the ration must not stimulate thirst. The formula required months of research. Over two hundred tests were made under the close supervision of an efficient chemist. It was fed to albino and Steenbock rats and, in some cases, rats fed the ration biscuit showed a superior gain of weight over rats fed a balanced diet. The finished biscuit tested per pound approximately 160 grams of carbohydrates, 150 grams each of protein and fat, 2,200 calories with a moisture content of 3.8 per cent, an estimated content of 700 units of vitamin B₁, and the balanced mineral supplements. One pound of the ration biscuit is equal in food value to ten pounds of old-fashioned hardtack used in previous wars. Its value in weight and space saving makes it ideal for emergency rations. The formula is available free for all armed forces of the Allies.

Thus soybeans are a potent ingredient in the rations for both mechanized warfare and civilian population.

SOYBEANS IN LEND-LEASE AND UNITED STATES AGRICULTURAL MARKETING ADMINISTRATION

Protein foods are indispensable to a nation in wartime, and the soybean is perhaps doing its biggest job in Lend-Lease.

Rich in protein, minerals, and vitamins, the beans are valuable at home as supplements to meat, milk, and eggs, but often abroad they must be substitutes for these foods. The low cost of the beans, easy transportation, no need for refrigeration, and their versatile uses make them an indispensable food for feeding our allies.

According to Donald S. Payne, then senior technologist, Agricultural Marketing Administration, Washington, D.C., Lend-Lease



FIG. 1.—Ohio soybeans and Wisconsin cheese await loading on a United Nations freighter that will carry them as part of a Lend-Lease shipment to one of our Allies. (*Official OWI photo by Palmer.*)

purchases from July, 1941, to August, 1942, were 61,182,444 pounds of flour and grits. They were shipped overseas to be used in meat products, commercial baking, soups, ice cream, and in place of milk. In addition to the soy products, about 33 million pounds of soybeans were shipped in the same year to Great Britain, where they were ground into soy flour by the milling concerns over there. A recent British nutrition test of white bread made with 2 per cent soy flour shows that when baked the loaf could not be distinguished from the ordinary run

of bread, yet the protein content was 22 per cent greater. It is also of interest to note that 12½ per cent of soy flour was added to sausages and similar products, giving an added 35 per cent increase in protein to the fortified products.

Soybeans and soy food products now go with the Red Cross to battle fronts and prison camps, and with Lend-Lease into so many parts of the world that its name must be spelled in 15 different languages. The Soya Products Section of the Food Distribution Administration has released the following figures on total soy purchases (exclusive of army) for overseas shipments:

Type of Soy Product	Number of Pounds
Concentrated cereal foods containing soy	19,119,520
Dry soups containing 25 to 30 % soy	56,504,000
Dry cheese mix	6,000,000
Dry stew mix with 20 % soy (this was at the rate of approximately 672,000 lb. a month for the last 6 months of 1943)	4,032,000
Soy flour, most of which is destined for Great Britain and Russia—purchased since autumn, 1941	211,328,000
Soy grits	108,580,000
Soybeans, mostly for Great Britain—purchased since 1941 ..	104,463,000
High-protein spaghetti, destined for the spaghetti-eating countries of South Europe	1,500,000

These soy products must be packaged in specially prepared, moisture-resistant containers for overseas shipment. Preparation directions must be printed on the packages in 14 languages besides English.

For the United States, the Agricultural Marketing Administration has also taken an active interest in soy products. In 1942, five million pounds of dehydrated soup was used for school lunches. This soup contained 25 per cent of soy flour or grits, plus dried skim milk and other dehydrated and precooked legumes.

FOOD FOR GREECE

The story of Allied aid to Greece is one of the great mercy stories of the Second World War. Through international cooperation, nine ships under the flags of neutral Sweden and the Red Cross have been able to go from Canada to Greece and back again loaded with grain, food products, medicines, wheel

chairs, sewing machines, artificial limbs, and other necessities for the stricken people.

In 1941, it seemed that the people of Greece were doomed to a death of starvation. The nation was without food; the hospitals without medicines or supplies. Thousands of adults and children died in the streets. Often the bodies remained unidentified so that the families and relatives could retain their bread tickets.

The Greeks, like all victims of war, are sadly in need of protein food. This lack in the diet causes the body to swell and leaves the system more susceptible to infection. The spindle-legged, emaciated children and adults are victims not only of malnutrition, but also of malaria, tuberculosis, and other diseases. It has been estimated that it will take ten to fifteen years to repair the ravages of starvation, and in many instances its marks can never be erased.

The first mercy ship to sail to Greece was the Swedish ship, "Sicilia," which left New York City in March, 1942, loaded with more than 50,000 bags of flour, 9 tons of medicines, and 500,000 capsules of concentrated vitamins. Up to November, 1943, the United States through Lend-Lease sent 82,325,691 pounds of food to Greece. According to data from the War Food Administration, this consisted of

39,957,807 pounds of dry beans
10,692,490 pounds of chick peas
8,697,920 pounds of evaporated milk
2,819,834 pounds of sweetened condensed milk
6,665,440 pounds of dry soup concentrate
13,380,200 pounds of dry peas
112,000 pounds of baby food.

Since the great need in Greece is for proteins, several emergency foods that are high in protein and low in cost have been developed by the Food Distribution Administration with the cooperation of industry. These foods are based on soy flour and grits because they approximate the protein value of meat and milk and are far better in food value than peas, beans, oats, wheat, and corn.

One of these foods is soup, of which there are many variations that may be flavored to suit the taste of different nationalities. For instance, the basic formula used for school lunches has been

flavored to suit the Greek taste. One great advantage of soup is that it requires minimum preparation and equipment and needs only the addition of water.

There are several soup powders or mixtures containing soy. One of the best is that fortified with high vitamin B complex yeast, and large quantities of this soup have been sent to Greece. It consists of 50 per cent pea flour, 25 per cent soy flour or grits, 10 per cent skim-milk powder, 15 per cent spices, flavoring, and yeast. Two ounces of this soup—an average bowlful—gives 20 per cent of the daily protein requirement. Experiments show that the soup is a complete protein, rich in vitamins. Dry soups of this kind cost the United States government 15 to 18 cents a pound.

Another emergency food to be made with water is a concentrated cereal as used in Russia, composed of 56 per cent rolled oats or wheat, 20 per cent soy grits or flakes, 14 per cent skim-milk powder, 8 per cent sugar, and 2 per cent salt. This is mixed for quick cooking and for emergency feeding on a large scale.

Another excellent food is a stew mix containing several ingredients and having the flavor of a meat and vegetable stew. It is a combination of chick-peas, green and yellow peas, navy beans, carrots, noodles, potatoes, mixed greens, barley and soybeans. This mixture, however, must be soaked and then cooked for 20 minutes.

High-protein spaghetti is made for Greece and countries of South Europe containing 83 per cent durum-wheat flour, 15 per cent soy flour, and 2 per cent egg solids.

Properly balanced emergency foods mean life itself to Greece. The same is true for millions of people who have seen the destruction of war and have felt the pinch of hunger.

SOYBEANS AND THE MEXICAN INDIAN

A new project for the soybean is in the diet of the Mexican Indian. The following summary is taken from the April, 1943, issue of the *Soybean Digest*. One of the principal reasons why the agricultural and industrial production of the Indian-Spanish countries of America cannot satisfactorily meet the requirements of their own or the urgent demands of the markets of the United Nations in this year of war is the deficiency in the diet of their

own people. The usual diet of the Indian farmer is the same as before the Mexican Conquest and is so unsatisfactory that his physical energy is below normal and his work not so efficient as it would be if he had a balanced diet. Among the Indians of Mexico, for example, the basic diet is corn, peppers and their derivatives, beans, and a few other vegetables. These people get an insufficient amount of protein and other nutritive elements. They need the food value as found in meat, milk, eggs, and cheese, but the lack of economic facilities makes it impossible for the people to get these foods. Soybeans can help solve this problem, too.

A project is now under way in the valley of Mezquital, in the Mexican state of Hidalgo, to cultivate soybeans and teach the Indians how to use them as food. Dr. Manuel Gamio, Director of the Inter-American Indian Institute at Mexico City, has long worked for the economic betterment of the Indians in his country. He is now seeing his dream fulfilled with the aid of the soybean. It is hoped that most of the necessary funds will be furnished by the government of Mexico, the Office of Coordinator of Inter-American Affairs, and the Institute.

SOYBEANS IN HAWAII

The food situation in Hawaii, since it has become the front line in a war zone, opens up new territory for the soybean to conquer. The Hawaiian Islands are now faced with the necessity of increased home food production to make their population more self-sustaining. Heretofore, local production of food crops has been far below local consumption, and there has been a great lack in crops of high oil and protein content for a balanced diet. This condition is due to many reasons such as an unfavorable climate for crops, a prevalence of insect pests, and a prevailing economic setup. The last may be set aside when it is a matter of eating or going hungry, but the pests and climate are a permanent problem. Hawaii must select crops that can be grown, and of these she must pick those that contain the necessary nutriment to meet the present emergency. The soybean can fulfill these requirements and ranks high as a food crop for war-time Hawaii.

C. G. Lennox, in a discussion of the edible soybean in Hawaii, says:

The edible soybean assumes a position of prominence as a source of substitutes for animal proteins and oils in Hawaii's program of self-sustenance.

The high protein content of the green shelled beans, quickness in developing a crop, freedom from serious insects, pests, and diseases, and cheapness of planting, cultivating, and harvesting in terms of man-days per ton of green beans, all contribute to the value of the soybean as an emergency food crop.

Success with the year-round production of soybeans in Hawaii hinges principally upon the correct choice of varieties for planting in the different seasons; secondly, upon sufficient fertilization with nitrogen and phosphorus.

Should a food shortage be predicted or foreseen in Hawaii, a crop of green edible soybeans can be ready in 60 to 70 days. They can be harvested with machinery already on the Islands and quickly transported to centers of population. The dry beans, yielding a still more nutritious food, are often mature in less than 90 days. The dry beans can be used, or they can be made into flour and oil. It is no wonder that Hawaii favors the soybean as an emergency food.

The Hawaiian Sugar Planters' Association has prepared Table II giving estimated yields of three kinds of beans.

Table II.—Estimated Yields of Calories, Protzin, and Fat per Acre per Month

	Esti- mated yield, lb. per acre	Months to com- pletion of har- vest	Esti- mated yield, lb. per acre per month	Calories per acre per month	Lb. pro- tein per acre per month	Lb. fat per acre per month
Kidney beans (green string).....	5,000	2.3	2,174	364,000		4
Lima beans (green shelled).....	4,000	4.0	1,000	566,000	75	8
Soybeans (green shelled).....	3,000	2.3	1,304	768,000	163	67

The figures in Table II are based on field and experimental experience at Kailua and Waipio substations in 1941 and 1942. Yields on soybeans are based on plantings made from April to July.

WORLD-WIDE USE OF SOYBEANS

Edible soybeans are not new in Hawaii. They have been experimentally grown since 1908 but have never been a food crop of the Islands. Growing conditions in Hawaii are suitable for year-round production of most vegetable crops but not of the soybean. It is a plant whose time of flowering responds to the length rather than the temperature of the day. Mr. Lennox gives the following explanation of why it has not so far been grown successfully the entire year:

The soybean is one of a large group of plants which flowers under the stimulus of a long period of darkness. Although the daylength of the shortest day in Hawaii is only two and one-half hours shorter than the longest day this is quite sufficient to have a profound effect on the soybean. During the summer season the plants come into flower in exactly the same length of time as recorded on the mainland, but as the days shorten the flowering commences sooner. Nearly all the flowers bloom at the same time on the soybean plant and if the flowering is initiated before a full-sized plant has developed, the number of flowers is proportionately reduced. The reduction in number of pods per plant results in a reduced yield per acre. It is this stimulus of the short day resulting in small crops that has retarded the interest in soybeans as a vegetable crop for Hawaii.

It appears that the chief factor in successful soybean production in Hawaii is the right selection of seed for spring, summer, late summer, fall, or winter planting. The experiment stations of Kailua and Waipio suggest some eight varieties of seed and place emphasis on early maturity and large-sized beans.

Today soybeans are a war emergency food for Hawaii, but in the future they will be used for their qualities of making a good food better. No doubt peacetime Hawaii will get most of her soybeans from the United States in the form of such soy products as soy flour, soy grits, soy soups, and soy cereals.

These are only a few specific examples of the great nutritional and economic values of the soybean. It has stood the test of time and has not been found wanting. The experience of centuries in the Far East confirms its nutritive value. Modern research and science bring forth its dormant talents to help solve the problems of a global crisis and to meet the challenge of an ultramodern postwar world that must understand and follow the laws of optimum nutrition in order to achieve its high destiny.

Chapter III

Soybeans and Industry

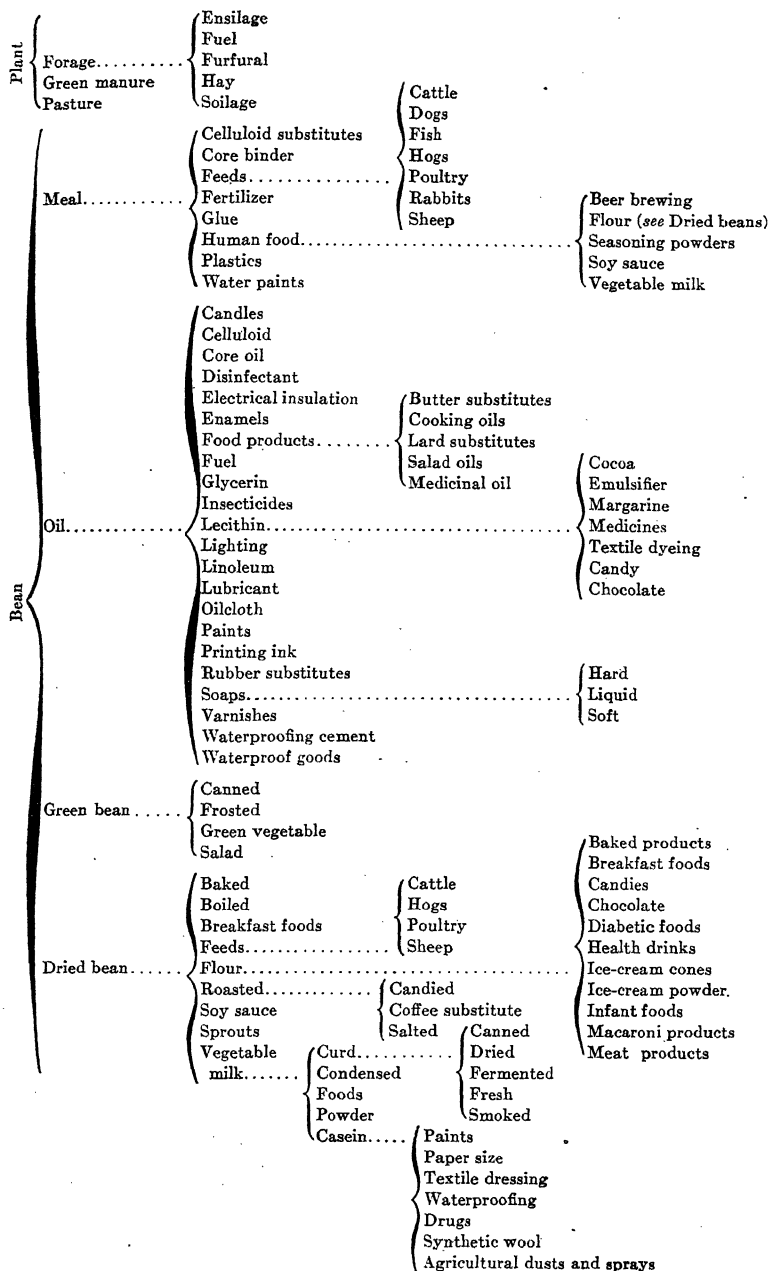
THERE is an old saying, "You can't tell by the cover of a watch how it is going to tick." Little did the missionary who sent a few soybean seeds from China to this country ever dream that the small round beans would someday be instrumental in changing American agriculture, industry, and even everyday living. The unassuming soybean has grown from a one-time forage crop to the mighty soy.

THE VERSATILE SOY

The secret of soy versatility lies in the chemical composition of the bean, with its 40 per cent of protein and 20 per cent of fat that can be pressed out or extracted as oil. As a result, the protein of the beans can be made into plastic, or spun into wool, and the oil can be made into paints and varnishes or refined for salad oils and soap.

From the oil we can get enamels, varnishes, waterproof goods, linoleum, paints, celluloid, rubber substitutes, soap stock, printing ink, lubricating oil, core binder, candles, and lecithin. Lecithin in turn can be used for a host of purposes, in the tanning of leather, in candy manufacture, in medicine, or as an emulsifier.

The soybean protein left after the oil has been extracted can be used in the manufacture of glue, as a celluloid substitute, in water paints, vegetable casein, plastic materials of all kinds, paper



sizing, paints, textile dressing, waterproofing for textiles, drugs, and synthetic wool.

It is no wonder the possibilities of the soybean have been termed "too numerous to mention" and that so far it rates as our best example of a chemurgic crop.

Mr. Kent Pellett of *The Soybean Digest*, Hudson, Iowa, in a radio broadcast of our soldiers as they landed in Africa, mentioned that

. . . the PC boats which are capable of tremendous speeds and which protected our transports for the African invasion were put together with soybean glue, soybean resin, plastics and with laminated plastic parts using soybean binders.

Their transport planes were made in part with plywood that was put together with soybean glue. Our paratroopers were carrying mess kits made of soybean meal, eating tools of soybean plastic because of its extremely light weight, and automatic rifles into which soybean plastic parts were incorporated. On their heads were plastic helmets which had been shaped with soybean binder, on their feet shoes which had been tanned with the use of soybean protein, and on their uniforms buttons made of soy plastics.

The manufacture of most of these special products has, however, been postponed to the postwar era, because present government rulings have restricted most of the soybean crop to food uses.

The versatile soybean, however, can be used in everything from celluloid to synthetic wool. The chart shown on page 31 is proof of its almost limitless possibilities.

The soy exhibit car of the Pennsylvania Railroad displayed the uses of the soybean in industry as shown below (see Chap. VI, page 110).

USES OF THE SOYBEAN IN INDUSTRY

Black molding powder	Soybean protein, ortho type
Red molding powder	Sterol
Tires	Crude solvent oil
Upholstery	Crude expeller oil
Albusoy	Raw filtered oil
Mulsoy	Break-free oil
Linoleum	Refined oil
Ortho soy oil	Bleached oil

Fractionated oil	Soy dusting powder
Soy protein fiber	Soy-flour adhesive
Reflectolite paint	Stearic acid
Water paint	Phenolic resin
Soya protein paste paint	Insulating board covering
Auto paint	Soy elastic paint
Vinylite resin	Bleached lecithin
Methacrylate resin	Unbleached lecithin
Plastics:	Soy paint—12 kinds
Steering wheel	Soy traffic paint
Ashtrays	Soy varnish
Boards	Soy enamel
Chips	Sizing material
Bottle caps	Sized leather
Pencil	Sized paper
Horn button	Sized cloth
Gear-shift ball	Soy spray oil
Switch parts	Soy liquid soap
Fuse block	Soy hard soap
Tractor seat	Soy facial cream
Soy wood	Soy wood preservative
Soybean glue	Soy core oil
Soy glued plywood	Soy core binder
Refined lecithin	Soy ink
Unrefined lecithin	Glycerin
Isolated protein	Soy rubber

SOYBEAN PAINT

Soybean oil up to 1940 has been relatively more important commercially than the meal. One of its first uses was for paint. In the early days, the automotive industry absorbed much of the small total output. Soybean oil makes excellent paints and varnishes and soon proved its merits in the automobile world. Ford automobiles have been painted with enamel containing 35 per cent of soybean oil ever since 1934. Department of Agriculture literature has urged the farmer to grow soybeans for the oil to make paints and varnishes to protect our ships, guns, tanks, and planes.

Most of the soybean oil used in industrial paint is used in priming coats, Duco finishing, and blending with rapid-drying

oils. Because of their nonyellowing qualities, the fatty acids of the oil have been used for some time in the production of certain resin enamels. Characteristics such as a tough elastic film, the ability to stand up for years without cracking or peeling, resistance to yellowing, ease of application, and wide coverage have made soybean-oil paint superior to many paints. The best proof of the durability of any varnish is its freedom from "alligatoring," that is, checking or cracking on the finished article. Soybean-oil varnish does not alligator, check, or crack.

One of the major problems of varnish and paint manufacture has been to find a suitable domestic substitute for the foreign oils used in paints and one whose supply could be increased as demands increased. The war intensified this need as perilla, sesame, and tung oils were cut off. Soybean oil can help make up the deficiency and is a satisfactory substitute, since there is no loss in durability either when utilized as the only oil present or when blended with other oils. Soybean oil is classed as a semi-drying oil, but paint laboratories are rapidly finding a solution to this problem. Fast-drying, 100-per cent soybean-oil paint has now been developed and demonstrated. John J. Kessler, president of the Soybean Paint and Varnish Institute, St. Louis, Mo., reports that this type of paint has all the qualities of first-class paint. This opens a great future for soybean oil in the paint industry.

SOYBEAN PROTEIN

Soybean protein is a relatively new commodity on our markets; and, in order to find a permanent place among such other competing industrial proteins as casein, gelatin, blood albumin, egg white, fish glue, zein, synthetic adhesives, and plastics, it must meet competition in regard to both quality and cost.

Soybean protein resembles casein (protein material from milk) more closely than any other protein and is considered an equivalent in the making of plywood, plastics, water paints, paper sizing, leather finishes, and insecticide sprays. In paper coating, it results in a darker color (see page 42). On the other hand, it has been discovered through technological research by the Department of Agriculture that soybean proteins possess some properties superior to those of casein. In addition to being

equivalent to casein, soybean protein is suitable for newly developed uses that are not in competition with casein. The postwar world will no doubt have room for both casein and soybean protein.

HENRY FORD AND SOYBEANS

Things do not "just happen" in the industrial world; the way is always led by someone with an idea and the willingness to work at it. The riddle of soy oil and soy meal intrigued many a chemist, research expert, and industrialist. Soy processors have spent years and millions of dollars in research on the two products and are largely responsible for the host of industrial applications. Henry Ford has been one of the chief leaders of research in this field and has made practical application of his products in his plants. Mr. Ford has had a lifelong conviction that industry must turn to the soil for many of its materials.

His first experiments were made in a laboratory in connection with the Edison Institute at Dearborn in 1930. In these experiments, several tons of wheat were used, also several thousand bushels of carrots; sunflower seeds, which have a high oil content; cabbages; onions; and cornstalks. It was not until December, 1931, after a long series of experiments with the soybean, that Mr. Ford and his chemists felt they were at last approaching a solution of the problem of finding a basic farm material from which the ordinary farmer could develop a commercially profitable product.

Starting with a small patch behind the research laboratories at the Ford Motor Company, the Ford soybean experiment has developed into a prodigious project. During 1932 and 1933, Mr. Ford spent more than \$1,250,000 on it. In 1939, his huge farms in Lenawee County, Michigan, yielded nearly 82,366 bushels. The great bulk was put through a specially devised oil extractor that yields slightly more than 1 gallon of oil from a bushel of soybeans. This oil was put to a variety of uses. It was extensively employed in the baked-enamel finish of the car and in foundry sand cores, soaps, paints, stearic acid, and glycerin. The meal went to the titanic River Rouge plant and was made into a plastic compound and eventually molded into accelerator pedals, coil covers, and other parts of the Ford car. The possibility of an all-plastic car in the future is another hurdle for research.

Soybean meal consists of about 44 per cent protein, and Mr. Ford's latest soy development is a new fiber made from this protein that compares favorably with wool (see Fig. 2).

As early as May, 1942, the Ford Motor Company announced that it was producing its synthetic wool at the rate of 1,000 pounds a day. A new processing plant has a capacity for 5,000 pounds a day, or more than a million and a half pounds a year. The soybean yarn is light tan in color and has a medium luster. It has the softness of wool as well as a natural crimp, and its strength is well above 80 per cent of that processed by virgin wool. It is said to be especially resistant to the action of molds.

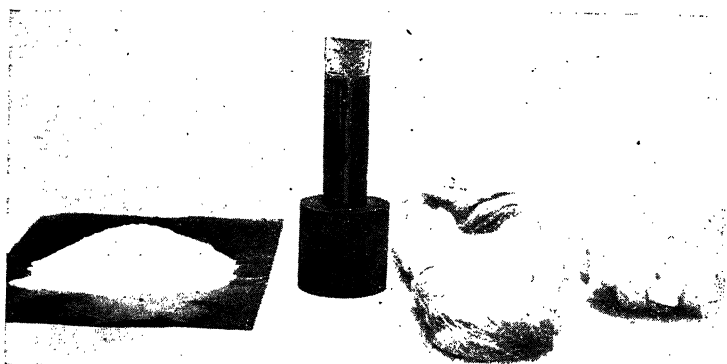


FIG. 2.—A handful of soybean protein, protein spinning solution, skein of soybean protein fiber, and carded fiber. (Courtesy Ford Motor Company.)

The *Ford News* of February, 1942, gives this explanation of their process:

The protein makes up about 50 per cent of the soy meal. This is dissolved by mixing the meal violently for 30 minutes with caustic soda and water, and treating the solution with sulphur dioxide gas, thus precipitating the protein in curd form. The mass is heated, which causes the protein to dry in small granular particles. Samples of the dried substance are then tested to be certain that the right quality is present.

The prepared protein, now ready to be put into the spinning solution, is soaked in twice its weight in water, and a special solvent mixture is added to bring the protein into solution. This molasses-like fluid is poured into a tank and subjected to 60 pounds of nitrogen pressure. Nitrogen is used because it does not react with the protein. The pressure forces the solution through a filter and into a spinneret.

The spinneret, resembling in shape a straw hat, is a circular piece of gold alloy $1\frac{1}{2}$ inches in diameter, the front surface of which contains small holes varying between 500 and 1,000 in number. The protein solution is forced through these minute openings into an acid-coagulating bath that immediately precipitates and hardens the solution into thin fibers.

As the fibers set, they are drawn from the bath onto glass reels and chemically treated for hardening and strengthening. The fiber is removed from the reels in skein form to be washed in water, cut to staple length, and dried. For the first time the fiber resembles wool or cotton.

Samples of each batch of the dried strands are taken to the laboratory where under controlled temperature and humidity they are tested for tensile strength (dry and wet), elongation, resistance to acids and ability to hold dyes. Ford chemists have developed their own dyeing method for soybean fiber as the procedure for wool was not satisfactory, and have found that this new material takes the dye better than the animal product.

The fiber is next given to the textile division where it is made into yarn under carefully regulated conditions.

The main object of making this wool was to supply upholstery for Ford cars. Yet it can also be used in filling for hats, in material for suits, topcoats, and carpeting. The story of Mr. Ford's soybean suit has created a great deal of interest and has introduced the possibilities of vegetable wool in the postwar era (see Chap. X, page 171).

Work on soybean fiber will be carried on by the Drackett Company of Cincinnati, Ohio, who have taken over the Ford fiber-development plant. As yet, they have not named the fiber. Mr. Drackett says that it is not a competitor of any other fiber but is an entirely new raw material with a growing field of usefulness. It may be blended with cotton or wool or may be woven into fabrics. It can be made either moisture-absorbent or moisture-resistant.

The Glidden Company of Chicago, Ill., ever alert to soy possibilities, have also announced the production of fiber made from soybean protein.

American concerns are not the only ones interested in and experimenting with the possibilities of soybean fiber. In 1940, it was reported that the Japanese were building a factory to produce from 20 to 30 tons daily of synthetic-wool fiber. Italy

was also reported to be experimenting with soy protein and preparing to grow the beans in Ethiopia.

Soybeans in the automotive industry have caught the headlines, and many persons have the idea that a vast number of the beans flow from the farm to the motorcar factory. Such is not the case. As yet the automotive industry uses only a very small fraction of our crop. Mr. Ford and his research men have proved that farm crops can go into industry, and they have been experimenting for the future of the industry. His experiments have proved that "great oaks from little acorns grow" and that we never know what next the test tube will produce.

SOYBEAN GLUE

Another success story of a product from soybean meal is that of soybean glue. It was the discovery and development of this glue about twenty years ago that revolutionized the plywood industry. The successful founder is Irving F. Laucks, of Seattle, Wash. Today, I. F. Laucks, Inc., is perhaps the largest user of soybean meal for nonedible purposes.

As a chemist, Mr. Laucks was called upon to test the cargoes of soybean press cake from Manchuria that used to be unloaded in Seattle in the days just after the First World War. He was convinced that there must be some industrial use for the product, and he tried it out as soybean glue. In those days, the infant fir-plywood industry in the Northwest was searching for a water-resistant, low-priced adhesive, and Mr. Laucks got a chance to try his glue. It is from that time that the fir-plywood industry can date its growth—up to the present billion and a half square feet of plywood glued annually with soybean glues.

Today, Mr. Laucks and the firms he has licensed turn out some 30,000 tons of soybean glue annually. This glue has the advantage of being cheaper than starch glues and is, in addition, water-resistant.

The history of soybean glue was not the simple matter of testing glue in a laboratory and then going out and gluing fir up into veneers. There were years of trial and error, of developing methods of processing, oil extraction, grinding, and milling and of trying to get uniform bean cakes from the Orient.

Like any new product that is decidedly different, soybean glue had to overcome numerous difficulties before it was accepted

by the trade. In the first place, it exhibited characteristics that, at that time, no accepted glue possessed. Early soybean glues had the consistency of mush or thick soup; but they showed no inclination to string or to be gummy as other glues did.

Furthermore, the plywood manufacturers were dubious because no one had ever heard of a water-resistant glue made from a vegetable source. "Vegetable," at that time, as applied to glue, denoted starch, and starch was known definitely to be nonwater-resistant.

In 1926, the plywood industry finally gave soybean glue (Laucks's "bean soup," as it was called) a try on a large scale. The plywood manufacturers had been suddenly faced with the problem of securing an abundant source of water-resistant glue in a hurry to meet the demands of the automotive industry for running boards that would not delaminate when coming in contact with moisture. Demonstrations of various types of water-resistant glues were made, and Laucks's was accepted. So successful was it that within one year every plywood plant on the Pacific coast was using soybean glue exclusively.

The very characteristic of the glue that had kept it off the market for so long—its lack of stickiness—became one of its prime assets. Because of this lack of stickiness, veneers glued with soybean glue are easier to handle, and production is speeded up. Because soybean glue does not foam easily, spreaders can be operated at high speeds.

Soybean-base adhesives have been found to be ideally suited for use with many woods. Their uniformity, low cost, high degree of water resistance, and ease of application make them especially suitable for large-scale industrial use.

Soybean glues are used extensively wherever fir, pine, spruce, and other coniferous woods are made into plywood—notably on the Pacific coast of the United States and Canada, in Sweden, Norway, and Australia. They are also used on many deciduous woods, such as gum, birch, cottonwood, especially for box shook and similar grades of plywood. Today Laucks, Inc., have plants in Washington, Illinois, and Virginia and serve not only the United States but Canada, Australia, and Europe (through a plant in Stockholm, Sweden). Following on the heels of soybean glue came numerous industrial applications: paper coatings, adhesives for washable wallpaper, binder for paints,

emulsifiers for fruit sprays, binders for briquette making, etc. They also developed waterproof synthetic-resin glues as well as a hot-press soybean glue. Several years of development and field use of soybean hot-press glues have now proved that better plywood can be made in the hot press at no greater cost than in the old cold-press process. Hot-press plywood is superior in strength, water resistance, uniformity, and in its finished properties.

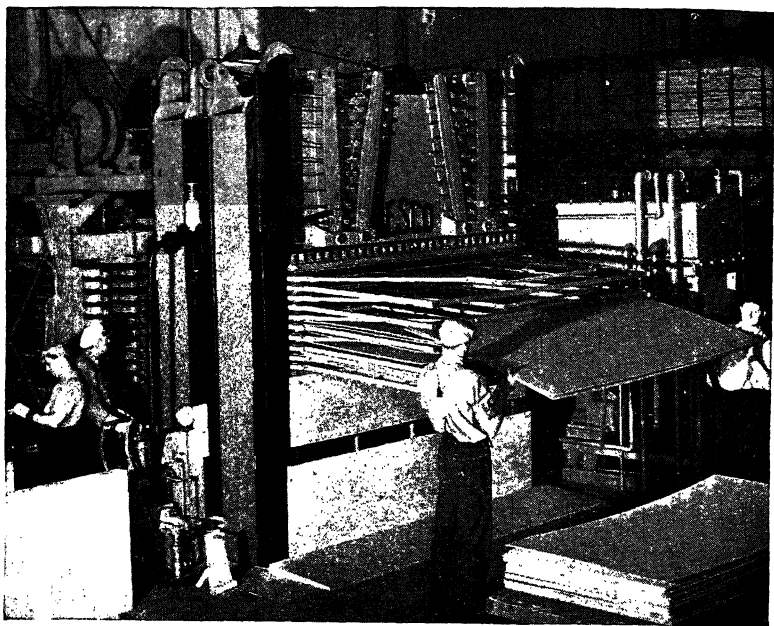


FIG. 3.—Soybean-glued plywood panels coming out of a hot-plate press at the West Coast Plywood Co., Hoquiam, Wash.

Soybean glue is one of the first large-scale technical applications of the beans in industry, another pioneer's dream come true. The postwar world of airplanes and plywood homes will not lessen the demand for this type of glue.

RUBBER SUBSTITUTE

Soybeans for rubber! Not for tires but for innumerable other uses that mean a conservation of our supply of natural rubber. Soybean rubber can be used as gaskets for food closures,

as industrial gaskets, belting, insulating mats, hose linings, adhesives, and many latex products. Direct military uses include numerous gadgets, insulating parts, shock-absorption pads, gaskets, and so forth, employed in the manufacture of aircraft, naval vessels, cargo vessels, motorized military wheels, motorized weapons, chemical-warfare supplies, ammunition cases, and much miscellaneous equipment.

Norepol, the first soybean rubber, is the product of a discovery of the Northern Regional Research Laboratory, Bureau of Agricultural Chemistry and Engineering, U.S. Department of Agriculture, Peoria, Ill. They found that certain polymers from vegetable oils may be compounded and processed to yield a product that may be milled, calendered, and vulcanized in conventional rubber-processing equipment. However, at present no details are available on the chemical constitution or on methods of production because of restrictions imposed by a government secrecy order. The government announced commercial production in January, 1943, and that nearly 100 tons had been made and passed into consumer hands. So far, no figures have been released as to the total output. At the present time, several grades are made on a commercial scale by at least four companies under their own trade names. The original name *Norepol* is derived from *Northern Regional polymer*.

Norepol is similar to natural rubber in certain respects, inferior in others, and superior in others. It is not recommended where high abrasion or tensile strength and great elongation are essential. Tests have proved that in flexibility at low temperatures it is comparatively equivalent to all natural rubber for all practical purposes. In aging tests, it behaves better than natural rubber, is less susceptible to attack by the elements, and in resistance to oxidation greatly surpasses natural rubber.

Norepol is not a true synthetic rubber but is rather a rubber substitute. It was put out as an emergency product to help the war effort, and need for it in the future depends on the success of the rubber program. The production of Norepol has been curtailed in the past year because of the shortage of fats and oils. Its value as a postwar material is uncertain.

The Northern Regional Research Laboratory has found that other useful products can be made by methods similar to those used to produce Norepol. The newest item of this kind is Nore-

lac, another soybean-oil product. This resin has remarkable properties, particularly when used in lacquer formulations. Its water-resistant and thermoplastic qualities make it an excellent moistureproof coating for food wrappers. Norelac promises to fill an important need for package-sealing resins in our shipments of dehydrated and other processed foods all over the world.

PAPER INDUSTRY

One of the newer industrial products and one with a very promising future is the isolated soybean protein, or alpha protein, as it is called. The Glidden Company worked for many years on this product; it was one of their largest and longest projects. Today alpha protein is successfully produced on a commercial scale as an industrial raw material.

Alpha protein is used in the paper industry in two principal ways, as an adhesive in coating paper and as an emulsifying and dispersing medium in sizing of paper in the beater. By far the larger consumption is for coating of paper, where it is used to bind particles of pigment such as clay, calcium, carbonate, satin white, etc., together and onto the surface of the sheet of paper in order to make the surface smooth and suitable for printing. Alpha protein is now taking its place along with other adhesives such as casein, starch, and glue.

Soybean protein is received in the paper mill in dry form, is then dissolved in water with suitable alkalis such as soda ash, ammonia, or caustic soda in batches of several hundred pounds. It is then mixed with a suitable pigment, such as clay, and with water; other necessary ingredients are added, such as color for tinting to obtain the desired shade; and it is then applied by different mechanical means to the surface of the paper in an endless roll. After drying and calendering, the surface of the sheet is quite smooth with a more or less glossy appearance in which the soybean is contained as a thin, continuous, almost colorless film, holding all the ingredients together and on the surface of the paper.

Besides paper coatings and sizings, alpha protein is valuable in water paints, plastics for buttons and buckles, leather dressing, insulating boards, linoleum, and adhesives for various purposes, such as making furniture and abrasive paper.

PLASTICS

Soybean plastics have held the limelight of the industrial soy products, and no one marvels that novelties and gadgets come from the bean. In fact, a person is likely to believe that a large percentage of the crop goes into products of this kind and that steering wheels, thimbles, and doorknobs are all made from soybeans. Such is far from true, for up to the present very little of our bean crop has been used for plastics.

But today, because of the present emergency, plastics are being used to replace metals, and there is a severe shortage of plastic molding powders. Soybean protein has been used successfully. The United States Regional Soybean Industry Products Laboratory, Urbana, Ill., gives this summary:

It is possible to use 20 per cent of treated soybean meal with 40 per cent of phenol-formaldehyde resin and 40 per cent of wood flour without decreasing the quality of the plastic or adding undesirable properties to the molding powder, in comparison with a 50:50 mixture of resin and wood flour.

Dyeing properties are definitely improved by the use of protein material from soybeans. Moreover, the use of the protein material makes it possible to decrease the phenolic-resin content because of the increased flow obtained with the soybean protein.

Research is being continued in the United States Regional Soybean Industrial Products Laboratory with the idea of using a larger percentage of soybean-meal products in admixture with phenolic resins and obtaining a plastic which is not inferior to those now on the market.

We are coming into the age of plastics, and the postwar world will find countless uses for these light and colorful materials. Just how many soybeans will be used in this competitive field remains to be seen.

SOY-COTTON HELMETS

The soybean grower and cotton farmer are joining hands, so to speak, in putting out safety hats. These have been developed by the United States Regional Soybean Industry Products Laboratory and the cotton workers at the Southern Regional Research Laboratory at New Orleans.

When heavy cotton cloth is treated with soybean material, the result is a plastic that can be used for helmets. They will not

turn a bullet as a metal helmet will, but the Department of Agriculture says that they can be used in mines and on construction jobs. The soy and cotton helmets protect a worker's head from falling tools, boards, bricks, and the like. They should prove excellent in place of metal helmets for home defense. In London, about half of the bombing-raid injuries requiring first aid were caused by falling glass. These soy-cotton helmets are lighter than metal helmets, can be made faster and cheaper, and save metal for other uses.

FIREFIGHTING COMPOUNDS

War has given the soybean another chance to prove its multiple uses. Foam, a firefighting compound made from isolated soy-

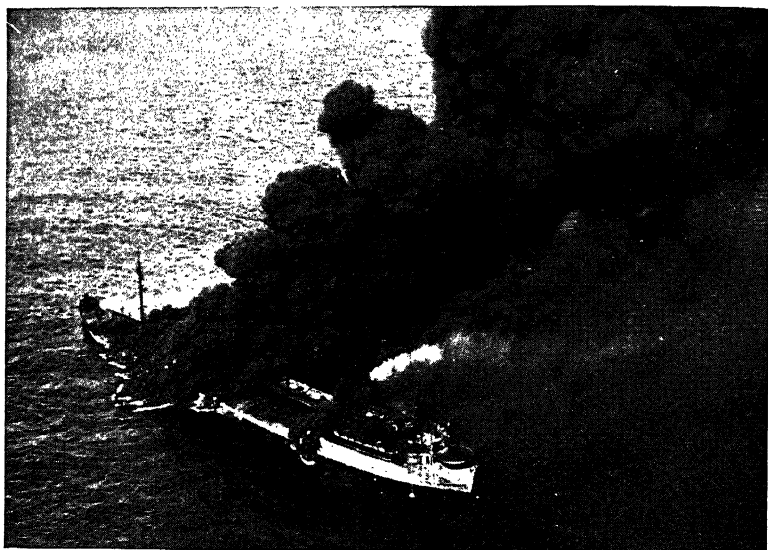


FIG. 4.—Raging fire on torpedoed United States tanker being brought under control by firefighting compound containing alpha protein derived from soybeans. (*Official U.S. Navy Photograph.*)

bean protein, has been seeing service with the navy and has been saving ships from the ravages of fire at sea. It is made by National Foam System, Inc., a century-old Philadelphia firm.

Its use at sea is far more complex than on land. On the ships, small pumps are used that are connected to large storage cans of foam. The foam is then projected through a nozzle; and,

with a favorable wind, this firefighting material can be thrown 70 feet or more. Tankers, airplane carriers, and merchant ships are equipped with the compound, and the men are trained to make the most efficient use of the foam. This valuable firefighting material will no doubt continue to save lives and property in the future and will play its part in industry.

LECITHIN

The versatile soybean yields still another product that bids for greater popularity in both the industrial and the food field. Lecithin is the natural product in egg yolk that acts as an emulsifier. Manufactured lecithin was extracted from the egg yolk until a Danish chemist discovered that the residue in a tank of soybean oil was lecithin and that it could be produced much cheaper from soybeans than from eggs. Soybeans do not have a high percentage of this product; but because of the large crop of beans and the large amount of oil made from the beans, the small percentage amounts to a large poundage and is the easiest and cheapest way of obtaining lecithin today.

The first commercial lecithin plant in this country was established in 1934 by the Archer-Daniels-Midland Company, at Chicago, Ill. Today several concerns are making lecithin for edible and industrial purposes.

As yet, no one knows all the uses of lecithin, and we are discovering more about it every day. We do know that lecithin combines water and oil of any kind and is soluble only in oil, fats, ether, or alcohol. Therefore, any mixture of water and oils or any mixture that contains a bothersome small content of water can be improved by the addition of a small amount of lecithin. It can be used wherever oil and water come in contact—in paint, ink, candy, bakery goods, emulsions, cosmetics, rubber, leather, oleomargarine, electroplating, and plastics. One of its important uses is as a stabilizer in ethyl gasoline; and quantities are used for gun greases. When used with creosote, it prevents bleeding of preserved wood.

In the food field, lecithin has been found to be an excellent addition in chocolate coating. It is also added to candies and confections for a perfect mix and helps to keep them moist and fresh. In Europe, lecithin has been added to many food products for its nutritive qualities. It is of value in cosmetics; and the

medical profession is using more lecithin every day as a food supplement (see Chap. VII, page 130).

FERTILIZERS

The fertilizer market, too, has been affected by the use of the soybean in the form of oil meal. An estimate in 1940 showed that 50,000 tons was used in this way. It is a fine source of organic nitrogen and has been found especially helpful on light soils for tobacco and vegetables. Experiments prove it useful for lawns and excellent for flowering plants, especially roses.

Thus has a small percentage of our soybean crop entered the world of industry. It can be roughly estimated that, to date, American cattle have consumed 90 to 95 per cent of the soybean meal and that the food industries have used 85 per cent or more of the oil for food purposes. The remaining small amount has made a place for itself in industry, and today its influence is felt in all phases of modern living. It is little wonder that the Oriental soybean is regarded as America's best chemurgic crop. The possibilities in the future for the soybean in industry can only be left to the imagination.

Chapter IV

Nutritional Nuggets

FOOD VALUE OF SOYBEANS AND SOY PRODUCTS

THE loaf of white bread we buy today looks no different from our staff of life of yesterday, yet it has been enriched with vitamins of the B family and with iron. If today's bread seems to stay fresh a little longer or seems a little more satisfying, the chances are good that it has been enriched still more by the addition of a small amount of soy flour.

The value of the soybean and soy flour as a fortifying food in our diet has been stressed for several years by the soy advocates, the soy pioneers, and the soy-flour manufacturers; but their efforts did not register very deeply in the minds of the American public. The nutritional challenge that has resulted from Pearl Harbor presents a different story, however. The talk given by D. Breese Jones, of the Protein and Nutritional Research Division, Bureau of Agricultural Chemistry and Engineering, Washington, D.C., at the Twenty-second Annual Convention of the American Soybean Association, held at Purdue University in September, 1942, was a nutritional shot heard around the world. Mr. Jones stressed the value of soy and other high-protein flours as supplements to our diet. As the result of this and similar information made available elsewhere, it has been estimated that more than 75 million persons have eaten soybean protein in some form or other in the past year. In fact, today it is

difficult for the average person to avoid consuming a small amount of soybean protein. It is in doughnuts, sweet rolls, pies, bread, soups, meat loaf, luncheon meats, even candy bars; and without our suspecting its presence this soy protein is enabling us to work a little longer a little easier and with a little more vitality. Nutritionally, the age-old soybean is finding its rightful place in the American diet. It has become one of our weapons of defense—defense of physical fitness; and it is one of the leaders of our Foods for Freedom program.

Soybeans can rightfully claim the honor of being one of the most concentrated and nutritive foods known to man. Because of their great food value, they not only have long had a definite place in the Oriental diet but now belong in the diet of America and of the entire world. They are nutritional nuggets that we must learn how to use because they will inevitably be an important factor in the balanced diet of the future.

VEGETABLE OR EDIBLE TYPES OF SOYBEANS

The first soybeans brought to this country from the Orient were the field types suitable for forage, the manufacture of oil, and other industrial uses. These beans are not especially adapted to use as human food and are not the type of bean that for centuries has been the main protein food of the people of Asia. The Oriental soy garden beans are the vegetable or edible types. The English, French, and Germans have discovered their value and have been using them in their diets for some twenty years but to the Americans they are practically a new food. Until a few years ago, we did not even have their seeds.

The edible soy seeds were brought in by the Bureau of Plant Industry of the U.S. Department of Agriculture. Since then they have been subject to extensive tests not only by the Department of Agriculture but by practically all state experiment stations (see Chap. VIII, page 137). Careful production tests have been made to check the type of plant, time of maturity, relative yield, and other pertinent factors from the standpoint of production. Reports and tests have also been made by many gardeners and institutions to whom the seeds have been sent for the purpose of determining the acceptability of the beans as a food in the average American household. Home economics laboratories all over the country have made tests to determine

palatability and the best types to use as green shelled beans and dry mature beans.

Agricultural stations of practically every state have been interested in edible soybeans, and the stations of the soy belt have made extensive research studies of the beans over a period of several years. The University of Illinois, for example, made tests on some 466 types of beans and as a result now lists 18 edible types of soybeans having superior qualities as food (*Bulletin* 453). Some of the edible types are still known by a serial number; but most of them now have names such as the Giant Green, Illini, Funk Delicious, Higan, Bansei, etc.

It is interesting to note that the selections made have been based largely on palatability and not on relative nutritive value. The fact that soybeans differ from familiar beans in taste and texture and also that they are not a native food makes the palatability factor unusually important. The real research work on the variety of soy seeds has hardly begun. As yet we have no beans that we can truly call our own, because all but one variety grown commercially, in the United States today have come to us from China and Manchuria. But we shall not long be in that position. We are doing something about it. New varieties selected for our soil and growing conditions, and adapted to our mechanical ways of farming and even to our tastes, are on the way.

Up to this time, there has been comparatively little promotion of the possibilities of edible soybeans as a food in this country. We have not needed them as a protein food; and, since soybeans have no outstanding features of taste or appearance, they have not been readily accepted by the American who prefers his favorite diet of meat, potatoes, gravy, and apple pie. The average American, until recently, knew nothing whatever about the "bean of life," as they are often called, unless he happened to meet them on a special diet; and then he usually tried to get away from them as soon as possible. It was beyond the scope of our imaginations that soybeans would ever be called upon to round out our supply of protein foods.

As late as 1938, the University of Illinois, in *Bulletin* 453, said that vegetable soybeans had two potential uses in the United States: one, the green beans would add variety to the limited list of green vegetables available in many markets early in the

fall; two, the mature or dry beans could be used to increase substantially the protein and caloric contents of the low-cost diets. They pointed out also that the further use of soybeans in this country would depend on economic conditions and the need of finding cheap sources of protein. Naturally the university could not foresee the rationing of the Second World War, the shortage of protein foods, and the job of feeding starving nations. Fortunately, the little insignificant-looking soybean is able to help meet all these needs. Overnight it changed from an occasional food that we did not know how to use to a protein necessity.

PROTEIN, FAT, CARBOHYDRATE

One of the Five Great Proteins. Soybeans are unique in their nutritional value because of their high percentage of protein and oil. Not only is the protein high in quantity, but it is of good quality, being practically the same in food value as animal protein, or that of meat, milk, fish, and eggs. Chemical analysis shows that soybeans contain in nearly maximum proportions the amino acids essential for the nutrition of man and animals. This means, in other words, that soybeans are sufficiently complete to sustain life for an extended period of time. They are our best source of protein from the vegetable kingdom and can honestly claim the title of "the meat that grows on vines." Soybeans, however, should be considered not primarily as a meat substitute but rather as a food ranking with meat, eggs, milk, and cheese in protein content and supplementing these foods in the diet. Soybeans and soy flour rank as one of the five great protein foods.

The chief function of protein in the diet is to supply the body with tissue-building material, and that is why life itself depends on these food elements. They are complex substances, and the chemical constitution of a natural protein is not fully and exactly known. We do know that they are made of many simple nitrogenous compounds linked together. These simple compounds, which we can call protein-building stones, are known as amino acids. Of the 22 known amino acids, 10 to 13 are considered essential to life and health. In other words, if the body does not receive all these essential amino acids, health is impaired and life endangered.

Nutritionally, proteins can be divided into two classes: complete and incomplete. The complete proteins contain all the amino acids necessary to maintain life, and the incomplete ones do not. Women all over the country are learning these facts in nutrition classes (one blessing that has come out of the war) and are applying them in their menu planning. It is essential that the body receive an adequate supply of complete proteins, or all the essential amino acids.

Animal proteins, with the exception of gelatin, are highly nutritious and contain enough of the essential amino acids to be considered complete proteins. Vegetable proteins, however, are not. The soybean is an exception to this rule and is the only vegetable considered complete enough in protein to rank with meat, milk, eggs, and cheese in the diet. Soy protein, when cooked, is as easily digested as any other form of protein; and some authorities believe that it is rendered still more digestible by sprouting.

Foods that are incomplete in protein can readily be made complete by the addition of foods containing some of the more highly nutritious proteins. A cereal, for instance, though incomplete in protein content, can quickly be transformed into a

Table III.—Essential Amino Acids in Various Types of Protein

Source of protein	Type of protein	7 of the 10 essential amino acids						
		Valine	Leucine	Phenylalanine	Arginine	Histidine	Lysine	Tryptophan
Beef.....	Muscle	0.8	11.6	3.1	7.5	1.8	7.6	1.2
Chicken.....	Muscle	?	11.2	3.5	6.5	2.5	7.2	
Eggs.....	Ovalbumin	2.5	10.7	5.1	4.9	1.7	3.8	2.2
Fish.....	Muscle	0.8	10.3	3.0	6.3	2.5	7.5	1.2
Gelatin.....	Gelatin	0.0	7.1	1.4	8.2	0.9	5.9	0.0
Milk.....	Casein	7.9	9.7	3.9	3.8	2.5	7.6	2.2
Salmon.....	Salmine	4.3	....	...	87.4	0.0	0.0	
Soybeans....	Glycinin	0.7	8.5	3.9	8.1	1.4	9.1	1.7
Wheat.....	Gluten	...	4.1	1.0	4.4	1.2	2.2	

D. Breese Jones, Amino Acid Comparison of Various Proteins, U.S. Department of Agriculture, Bureau of Chemistry and Soils, 1929.

The three other dietary-essential amino acids are isoleucine, methionine, and threonine, but no methods for quantitative determination of their presence had been worked out up to the time Table III was prepared.

more nutritious protein food by the addition of milk. Grain products can be fortified by the addition of eggs, cheese, and other animal proteins to make them more complete in essential amino acids. Should we shift to a heavy grain and legume diet, there is always the danger of impaired health due to the lack of complete proteins or enough of the essential amino acids in the diet. Here is where soy can come to the rescue. The versatile soybean and all its products can be used if necessary to replace animal protein or to supplement them or to fortify incomplete proteins. Perhaps its greatest value is as a supplement to or as a part of a complete food dish. For this reason, the soybean can meet the present nutritional needs at home and abroad and is an essential food in the mass feeding of malnourished peoples.

Soybeans not only contain high-quality protein, but their protein content is much higher than that of other foods. Compared with other foods, soybeans contain, according to the agricultural development department of the Baltimore & Ohio Railroad,

- 1½ times as much protein as cheese, peas, or navy beans
 - 2 times as much protein as meat, fish, or lima beans
 - 3 times as much protein as eggs or whole-wheat flour
 - 11 times as much protein as milk
-
- ½ times as much oil as cheese, almonds, or peanuts
 - 1 times as much oil as average meat
 - 2 times as much oil as eggs
 - 5 times as much oil as milk
 - 10 times as much oil as whole-wheat flour

The protein content of the bean varies. It is much higher in some beans than in others, because the percentage and quality of the constituents vary with the chemistry of the soil, climatic conditions, time of planting, and the variety of seed. The varieties low in protein are usually high in fat; and with a few exceptions those high in protein are usually low in fat.

Perhaps a more interesting comparison is between the protein content of low-fat soy flour and that of the four best animal proteins.

Two pounds of low-fat soy flour is equal in protein content to

5 lb. of boneless meat
 6 doz. eggs
 15 qt. of milk
 4 lb. of cheese

For those interested in facts of this kind, the Staley Manufacturing Company, Decatur, Ill., has prepared an excellent, authentic booklet called "The Miracle of Soy."

Soybeans vary in protein, fat, carbohydrate, and calorie content; but we can say that the average dry or mature bean contains approximately

8 to 14 per cent water
 33 to 42 per cent protein
 18 to 22 per cent fat
 25 to 32 per cent carbohydrate including fiber
 3.5 to 6 per cent ash
 1,590 to 1,993 calories per pound

Soy flours, or meal made from the whole soybeans, are similar to the dry beans in food value. Flours or meals produced by the solvent system are much lower in fat content, however, and higher in protein.

Table IV.—Average Composition of Dried Legumes

Description	Water, per cent	Pro- tein, per cent	Fat, per cent	Carbo- hydrates (includ- ing fiber), per cent	Ash, per cent	Fuel value, per lb., calories
Beans, dried (navy).....	12.6	22.5	1.8	59.6	3.5	1,564
Beans, frijols (New Mexico).. <td>7.5</td> <td>21.9</td> <td>1.3</td> <td>65.1</td> <td>4.2</td> <td>1,633</td>	7.5	21.9	1.3	65.1	4.2	1,633
Beans, lima (dried).....	10.4	18.1	1.5	65.9	4.1	1,586
Beans, mesquite (dried).....	4.8	12.2	2.5	77.1	3.4	1,723
Lentils, dried.....	8.4	25.7	1.0	59.2	5.7	1,581
Peas, dried.....	9.5	24.6	1.0	62.0	2.9	1,612
Cowpeas, dried.....	13.0	21.4	1.4	60.8	3.4	1,550
Soybeans, dried.....	7.5	33.0	21.0	29.6	5.0	1,993

The soybean reigns as king of the beans in food value. Note the great difference in protein, fat, carbohydrate, mineral, and calorie content when compared with other legumes in Table IV.

Carbohydrate. The carbohydrate (starch and sugar) content of the bean is low, being only one-half that of other dry beans. Much of this carbohydrate is of a kind not well utilized by the body; and, in effect, dry soybeans therefore contain only about 12 per cent of available carbohydrate, and the green beans count as a 6 per cent carbohydrate vegetable. Soybeans contain little starch; and for this reason both the green and dry beans have always been a logical item in diabetic and starch-restricted diets. In fact, it was the special dietary value of the soybeans that first gave them a toehold as a human food in this country. Their arrival via the "diet special" has been more of a hindrance than a help in gaining acceptance as a popular American food, however. The public, conscious of their so-called "diet properties," has usually avoided soybeans in any form until definitely instructed to use them.

The low carbohydrate content of the bean and especially of soy flour is greatly in their favor, for one of our main dietary sins is too much starch and sugar. It is no wonder then that the soybean in any form is popular with anyone who is "counting the calories" (see Chap. VII, page 129). Soy toast threatens to upset the established throne of the mighty Rye-Krisp with the reducing public.

Table V.—Breakdown of Carbohydrates in Soy Flour

Nitrogen-free Extracts		Per Cent
Galactan.....		5.26
Organic acid.....		1.71
Pentosan.....		5.43
Invert sugar.....		0.08
Sucrose.....		3.65
Raffinose.....		1.36
Starch.....		0.48
Cellulose.....		2.84
Waxes, color principles, tannings, etc.....		5.22
Dextrine.....		4.07
Total carbohydrates.....		30.10
Courtesy of Edward Kahl.		

Fat. The oil content of the soybean is very high, running from 18 to 20 per cent and more. This oil is readily digested and

compares in composition with olive oil. Like all oils, it is an excellent source of heat and energy.

MINERALS

Soybeans not only are an excellent and cheap source of protein but are also a protective food in that they are rich in both essential vitamins and minerals. Their inclusion in our diet would be a way of giving us some of the necessary elements that apparently are lacking; and, in addition, they would help in overcoming some of our deficiencies and ills due to improper foods. Soybeans are especially rich in calcium, phosphorus, and iron; and this applies not only to the whole bean but also to such soy products as soy flour and grits. Soy flour compared with wheat flour, for example, is about ten times as rich in minerals, fifteen times as rich in calcium, seven times as rich in phosphorus, and ten times as rich in iron. It is one of the cheapest sources of calcium known and has a tremendous value in fortifying other foods with essential food elements. It is an easy and inexpensive way of enriching food products with natural vitamins and minerals (see pages 56-57).

Table VI.—Mineral Content of Soybeans (Air-dry Basis)

	Per Cent
Ash.....	5.06
Potassium.....	1.91
Sodium.....	0.34
Calcium.....	0.21
Iron.....	0.0074
Copper.....	0.0012
Magnesium.....	0.22
Phosphorus.....	0.59
Sulfur.....	0.41
Chlorine.....	0.024
Manganese.....	0.0028
Zinc.....	0.0018
Aluminum.....	0.0007

From *Soybean Chemistry and Technology* by Klare S. Markley and Warren H. Goss, Chemical Publishing Company, Inc., New York.

It is no wonder that soy flour and other soy products will constitute a good share of the so-called "food enrichers" that will appear on the market. They will be highly publicized on the air, in print, and in nutrition classes. Americans will learn that soybeans are rich in protein, vitamins, and minerals.

Table VII.—Composition of Ash in Soy Low-fat Expeller Flour

	Per Cent
Potassium.....	2.00
Sodium.....	0.30
Calcium.....	0.30
Magnesium.....	0.24
Phosphorus.....	0.60
Sulphur.....	0.44
Iron.....	0.0075
Copper.....	0.0020
Zinc.....	0.008
Chlorine.....	0.03
	<hr/>
	3.9301
Ash content.....	5.4

Courtesy of Edward Kahl.

The difference between the total of the elements listed and the total amount of ash is due to the oxygen with which it is combined.

Table VIII.—Composition of Ash from Soy Flour and Wheat Flour

Constituent	Patent wheat flour	Low-fat soy flour	Number of times greater concen- tration in soy flour
Total ash (mineral), per cent.....	0.4	5.48	13.7
Calcium, per cent.....	0.02	0.24	12.0
Potassium per cent.....	0.11	0.61	5.5
Iron, parts per million.....	1.8*	66.00†	36.6
Copper, parts per million.	0.9	8.00	8.8
Phosphorus, per cent.	0.13	1.88	14.4
Alkalinity of ash†.....	4.0	2.71	

Data on wheat flour taken from *Bakers Digest*.

Data on soy flour from C. R. Fellers, Ph.D.

Courtesy of Soy Flour Association.

* Enriched white flour contains a minimum of 0.00136 per cent iron.

† Milliliters of 1N HCl required to neutralize ash from 100 grams of flour.

‡ 67 per cent available, which is significant.

VITAMINS

The exact vitamin content of the soybean is still a matter of discussion because complete data on all vitamins have not yet been compiled. So far we have only isolated bits of vitamin information, and the subject has received far less attention than it deserves.

We do know that the green beans contain vitamin A; B vitamins, especially thiamine, riboflavin, and niacin; and vitamin C. The dry beans have no vitamin C, almost three times as much of the B vitamins, and considerably less vitamin A.

Dr. Paul R. Burkholder, of Yale University, has made one of the most extensive vitamin studies of soybeans and to him we owe the facts in Table IX.

Table IX.—Vitamins in Edible Varieties of Soybeans

Data for B vitamins are given in micrograms per gram of dry matter. Ascorbic acid is expressed as milligrams per gram of green raw beans.

	Thiamine		Riboflavin		Pyridoxin		Biotin		Niacin		Pantothenic acid		Ascorbic acid
	Gr.*	Mat.†	Gr.*	Mat.†	Gr.*	Mat.†	Gr.*	Mat.†	Gr.*	Mat.†	Gr.*	Mat.†	
Aoda.....	5.6	9.6	4.1	2.3	2.9	6.3	0.66	0.63	46	20	11	11	0.24
Bansei.....	6.6	8.4	3.5	2.4	3.3	6.2	0.42	0.62	44	23	12	12	0.21
Giant Green...	7.6	8.5	3.6	2.1	4.2	7.4	0.52	0.69	26	19	11	14	
Hokkaido.....	6.6	9.5	3.0	2.3	3.2	6.6	0.54	0.51	37	20	12	11	0.18
Toku.....	5.6	9.0	3.1	2.1	3.5	5.4	0.66	0.72	40	19	12	12	0.19
Willomi.....	6.2	9.2	4.5	2.4	3.9	6.5	0.43	0.49	48	20	13	12	0.23
Means for 6 varieties.....	6.4	9.0	3.5	2.3	3.5	6.4	0.54	0.61	40	20	12	12	0.21

Courtesy of *Science*, Aug. 27, 1943.

* Gr. = green beans; † Mat. = dry mature beans.

Dr. Burkholder has also made an interesting study of the vitamins in soybeans, meat, and wheat. Some of the results are given in Table X.

Table X.—Comparison of Vitamins in Meat, Wheat, and Mature Soybeans

Data are expressed as micrograms per gram of dry matter.

	Thiamine	Riboflavin	Pyridoxin	Biotin	Niacin	Pantothen
Beef, round.....	2.1	7.5	2.6	0.08	160	17.0
Pork, ham.....	19.0	4.8	0.4	0.12	63	6.5
Tenmarq wheat.....	7.0	1.3	2.6	0.17	62	7.6
Soybean, average....	9.0	2.3	6.4	0.61	20	12.0

Courtesy of *Science*, Aug. 27, 1943.

Data on Meat taken from V. H. Cheldelin and R. J. Williams, *University of Texas Publication*: 4237, p. 105, 1942.

Dr. Burkholder gives the following summary on the vitamin B content of soybeans:

It is apparent that both immature and mature beans of all varieties tested contain appreciable stores of B vitamins. Comparison of the averaged data for green and mature beans of the six varieties shows with maturation an increase in thiamine and pyridoxin and a decrease in nicotinic acid. The vitamin values of soybeans compare favorably with wheat and with meats except that riboflavin and nicotinic acid in the beans are lower than in meat. It should be noted, however, that the niacin in immature soya occurs in double the concentration found in mature beans.

Several of the principal producers of soy flour and grits arranged during 1941 to have vitamin assays made on their finished products. The information disclosed interesting results and was made available for general publication during that year. The data secured in these assays are summarized in Table XI.

Table XI.—Vitamin Assay on Soy Flour

	Full-fat type	Low-fat type A (expeller)	Low-fat type E (extracted)
Thiamine (B ₁), I.U. per 100 g. . .	274	304	446
Riboflavin, micrograms per 100 g.	641	752	
Nicotinic acid, micrograms per 100 g.			4.77

In Table XI, vitamin B₁ activity was determined by the thiochrome method of assay, *Journal of the American Chemical Society*, vol. 61, p. 179, 1939; riboflavin activity by the Snell-Strong microbiological method of assay, *Journal of Industrial and Engineering Chemistry, Analytical Edition*, June, 1939; nicotinic acid content by the cyanogen bromide method of assay.

The manner of processing soy flour and grits would affect the carry-over of vitamin A appreciably, that of vitamin B₁ slightly, and would have little or no effect on vitamin G, or riboflavin.

Table XII shows the vitamin B complex content of various types of soy flour as compared with wheat flour.

Table XII.—Vitamin Content per 100 Grams of Material

Specific member of B complex	Type of soy flour			
	Low fat	Medium fat	Full fat	Wheat flour
Vitamin B ₁ (thiamine).....	200- 500 I.U.	200- 300 I.U.	230- 280 I.U.	75-125 I.U.
Vitamin B ₆ (pyridoxin).....	75- 100 units*	375- 500 units*	1,500-2,000 units*	130 units*
Pantothenic acid.....	840-1,960 µg	840-1,960 µg	1,400 µg	110 µg
Riboflavin.....	400 µg	400 µg	300 µg	90 µg
Nicotinic acid.....	6.0 mg.	5.7 mg.	4.85 mg.	5 mg.
Biotin.....	73 µg	70 µg	59 µg	6.85 µg
Inositol.....	220 mg.-	205 mg..	175 mg.	1240 mg.
Choline.....	225 mg.	225 mg.	225 mg.	

Courtesy of Soy Flour Association.

* Each unit is equal to 10 µg.

Table XIII gives the vitamin content of soy flour on a per pound basis.

Table XIII.—Tentative Average Vitamin Content of Soy Flours

All figures on a per pound basis

Type of soy flour	A, I.U.	B ₁ , I.U.	C, I.U.	D, I.U.	E, Evans rat units	Ribo- flavin, µg	K, µg
Full-fat flour (expeller)	650	775	36	27	726	1,600	500
Low-fat flour (expeller)	475	900	23	11	136	1,800	200
Low-fat flour (ex- tracted).....	200	1,100	X	X	X	2,000	X

Type of soy flour	Panto- thenic acid, µg	Niacin, µg	Pyri- doxin, µg	Biotin, µg	Inosi- tol, mg.	Cho- line, mg.
Full-fat flour (expeller).....	5,800	17,000	2,900	260	749	1,000
Low-fat flour (expeller).....	7,000	19,000	2,800	300	900	1,000
Low-fat flour (extracted)....	6,000	24,000	X	300	1,000	1,000

Courtesy of Soya Food Research Council.

X = data incomplete.

Table XIV.—Vitamin Content of Patent Wheat Flour Compared with Low-fat Soy Flour

I.U. = International unit equivalent to 0.6 μ g pure beta-carotene

mg. = milligrams or 0.001 gram

 μ g = micrograms or 0.000001 gram

Factor	Vitamin designation	Patent wheat flour (per lb)†	Low-fat soy flour (per lb)	Number of times greater concentration in soy flour
Carotene.....	A	136 I.U.	475 I.U.	3.5
Thiamine.....	B ₁	0.27 mg.	2.7 mg.	10.0
Riboflavin.....	G	0.41 mg.	1.8 mg.	4.3
Niacin.....	P-P	4.5 mg.	19.0 mg.	4.2
Pantothenic acid.....	....	2.7 mg.	7.0 mg.	2.5
Biotin.....	H	2.3 μ g	300 μ g	130
Choline*.....	(Bp)	?	1.0 mg.	?

Courtesy of Soy Flour Association.

Data on wheat flour taken from *Bakers Digest*.

Data on soy flour from Vitamin Committee of Soya Food Research Council.

* An accessory factor rather than a vitamin.

† Patent wheat flour that has been enriched contains a minimum of 1.66 mg. of thiamine per pound, 6.15 mg. of niacin per pound and 1.22 mg. of riboflavin (optional) per pound.

We know less of the fatty materials found in soybeans than we do of the B vitamins. Nutritional research has proved that fats and oils are more than energy foods and also contain fat-soluble vitamins. As yet we do not have complete data on the vitamins in soybean oil. J. L. Gabby, member of the Soybean Nutritional Research Council, gives this information in the April, 1942, *Soybean Digest*:

While soybean oil carries relatively little of the vitamins A and D, it is a good source of vitamins E, F, and K. Vitamin F is really a group of special fat constituents known as unsaturated fatty acids. Soybean oil is probably the most concentrated source of these unsaturated fatty acids to be found in our common edible oil.

Mr. Gabby also mentions that soybean oil carries minute traces of compounds known as sterols. One of the most recent achievements of chemical research on soybean oil is the commercial production of these sterols. It has been found possible to make certain sex hormones from these soybean sterols. As yet, however, this manufacture is still in its infancy, and our knowledge of its use or value is very incomplete. These facts

nevertheless have been fertile material for certain writers on soybeans, and their flights of fancy have equaled the exaggerated claims of the soy convert and the food fanatic.

As yet, we have much to learn of soybean chemistry, and therein lies a broad field for research. *Soybean Chemistry and Technology* by Klare S. Markley and Warren H. Goss is an excellent source of up-to-date facts for research workers and industrialists as well as teachers and students.

LECITHIN

Still the nutritive wonders of the soybean do not cease. Yet another of its great virtues is that it contains lecithin, a fat-soluble substance containing both organically combined phosphorus and choline essential for normal body functions. The lecithin content of the soybean has made it valuable in certain corrective diets (see Chap. VII, page 130). The medical profession is using more lecithin every day, and its value in the diet no doubt will be more clearly understood as time goes on.

Lecithin is also found in liberal quantities in egg yolk, but it is said to be more available in soybeans. The natural lecithin content of the egg yolk is what makes the yolk act as an emulsifier. Lecithin is derived also from corn. Milk has a natural lecithin content, and so have raw nuts. High-fat soy flour has a natural lecithin content of 1.5 to 2.5 per cent. German literature on the subject states that 1 pound of soy flour may contain as much lecithin as from four to six eggs.

No one as yet knows all the uses of lecithin, and more is being discovered about it every day. In Europe, it is now added to butter, oleomargarine, and ice cream to protect against acidity and improve the nutritional value. Lecithin acts as an emulsifier and is used in candymaking, in bakery products, and in emulsions. Candy, chocolate, and fancy sweets stay fresh longer because of the added lecithin. The same product is valuable in industry in paint, rubber, and leather, and wherever water and oil come together (see Chap. III, page 45). This is added proof of soybean versatility.

ALKALINE ASH

Last, but not least by any means on the nutritional side, is the fact that soybeans are alkaline in their ash, being rich in potas-

sium and other alkaline-bearing salts. This reason alone has gained them much favor. Since the majority of our protein foods are acid in ash, the alkaline soybean provides a welcome balance. Its alkaline ash has made it extremely valuable in corrective and special diets and as an aid in relieving acidosis. Also, soybeans have often been suggested in place of such animal proteins as meat, fish, and eggs for the same reason. Soybeans are the only complete protein that is highly alkaline in its ash.

ECONOMY

It would not be fair to close this discussion of the food value of the soybean without again mentioning its economy (see Chap. I, page 6). Often things of great merit are out of reach for the average consumer because the cost is prohibitive—not so with this food. Soybeans are our cheapest source of highly nutritious protein. Ten cents' worth of the dry beans will generously serve four to six persons and give them the food value of meat or fish. Soy flour or grits at a few cents a pound can replace beef and pork at several times that price. Soybeans will grow wherever corn is grown, and any family with a small plot of ground can raise the beans for food. They can literally grow a meatlike food in the back yard, with no expense except the cost of a few seeds, water if it does not rain, plus a little elbow grease for hoeing or weeding; and they will have that crop matured in 3 to 4 months. Moreover, the beans will keep indefinitely and require no special care for storing.

EXAGGERATED CLAIMS

It is little wonder that soybeans have been the poor man's meat of the Far East. With all these nutritional merits, it is not surprising that some persons have become a bit overenthusiastic about the use of the soy and soy products. Such unfortunately has been the case, and it has done the soybean and the whole industry more harm than good. It has made the average person a little skeptical, a little prone to ridicule or condemn everything said about the Oriental bean as an exaggeration. In many cases, however, soy has proved to be a wonder bean, a miracle food for someone. Thus we cannot blame the individual if he regards it almost as a "cure-all" and tries to feed it not only to his family but also to all his friends.

The protein of the soybean is not superior to that of meat or milk or eggs, as many would have us believe, nor has it any secret magic to make us young, vigorous, or beautiful. Not at all. The soybean is just a legume packed with extraordinary food value, and it should be used as such. Our trouble is that, as a consuming American public, we do not know how to use it. We have not been exposed to soy until just recently, because it has not been offered for sale in the ordinary market. It has been considered more or less as a special-diet food, and its sale has, therefore, been restricted to the specialty food shops and health-food stores. This difficulty will soon be remedied; for now the soybean has a general appeal, and already large concerns have started to manufacture and sell palatable and popular soy-enriched products. In the past, concerns specializing in soy products have usually been small and often of a religious nature, and they have not had national distribution of their products or money for extensive and educational campaigns. Because of public prejudice, the soybean, in spite of all its nutritional merits, is definitely one food that needs advertising and an educational program to make it popular. America learns through advertising. Now that our heretofore unimportant soybean has risen to fame and has gained its rightful place as a protein food that will be touched by the wand of big business, its value will soon become known, and it will find its way into the corner grocery store.

PRINCIPAL USES OF SOYBEANS AND SOY PRODUCTS

The soybean serves a double purpose in our diet: that of a high-quality protein and that of an enriching or fortifying food to step up nourishment. The latter use no doubt has the greater value not only for today but for tomorrow. *Soybeans in the future will no doubt serve as a plus element for better nutrition.* The whole beans are commonly used as a meat-replacement food, and such soy products as soy flour and soy grits are used for fortifying or enriching food. It makes little difference how they are used as long as they add the needed protein to the diet.

MEAT SUBSTITUTES

As has already been explained, soybeans are our best source of protein from the vegetable kingdom. They have served as a meat in Asia and can, if necessary, serve the same purpose in this

country. Soybeans could replace the American steer and the American cow, in the form of both steak and milk. True, the beans do not resemble a thick juicy steak, and we should probably be bothered by its luscious memory, but the food value is there. Many vegetarians, strictly conforming to their own beliefs, eat no animal products whatever and rely almost entirely on the soybean as a source of protein. To them, the beans have been a veritable lifesaver; and the beans, milk, cheese, butter, or flour is used almost daily. Many religious groups who do not approve of animal protein have used soybeans and various soy products in place of meat and fish, and their efforts have done much to promote and popularize the use of the beans in this country (see Chap. VI, page 105). Specialty food shops have always carried so-called "meat substitutes," and most of these contain soybeans in some form or other. There has, however, been little demand for such products in the average grocery store until the Second World War and its meat shortage.

Dry soybeans may be boiled or baked like any dried bean. They have been commercially canned for many years, and the canned soybeans in tomato sauce, now on the grocer's shelf, are as tasty as any baked or canned beans that we can buy. They may be eaten hot or cold and should always be considered as a heavy protein food in the diet.

Soy loaves, roasts, and various "meat substitutes" have always been popular with the vegetarian and have been commercially canned for several years. Many of the early products were poorly and unscientifically prepared, but all that is past history. Most of them now are excellent, and they are inexpensive when compared with meat and other animal proteins. Several of these foods contain grains, nuts, and other legumes as well as soybeans. All of them are seasoned to resemble meat in taste, and many are highly spiced and smoked to make them a vegetable bologna. These meat-replacement foods may be served hot or cold, sliced, diced, mashed, or whole, depending on individual taste and the cook's culinary imagination.

MEAT ENRICHERS

The meat industry has long known the value of soy grits or flour as a meat stretcher and enricher. In fact, the protein of soy is so like that of meat that it is difficult for the chemist to

distinguish between the two. The similarity of the two proteins has led to restrictions prohibiting soy in certain meat products (see Chap. VIII, page 145). Quantities of soy grits and soy flour have been used, however, in meat loaves, luncheon meats, and the like.

When added to meat, soy stretches our supply, improves the product nutritionally, and lowers the cost. Here is where soy in the form of grits and flour does a real job for the homemaker. They can be added to any ground meat and made into hamburgers, Salisbury steak, pork sausage, and all kinds of meat patties and croquettes. Packaged soy flour and grits for this purpose are already on the market, and many more are due to arrive (see Meat Loaf Recipes, page 216).

One of the best proofs of meat stretching or enriching is pork sausage. Soy grits, when used in sausage, produce a firm product with natural resiliency and the eating quality of a good meat product. Also, there is considerable saving when soy is used because the result is a sausage of high protein value at lower cost. The fry-away of fat is less than in straight pork sausage, owing to the high absorption quality of soy grits. The quality of the pork sausage is excellent, and in a recent test 9 out of 14 persons preferred the one containing soy. It is for these reasons that our army is contemplating the use of soy in pork sausage.

The value of soy in pork sausage has been discovered by Lend-Lease administrators, and they have purchased millions of pounds of coarse and fine grits to be used in meat products as a meat enricher. Lend-Lease pork sausage has contained as much as 22 per cent of soy flour or grits.

A government order in Britain specified that all sausage and similar products contain $12\frac{1}{2}$ per cent of soy flour, thus giving a 35 per cent increase in protein in these products.

The amount of soy grits may vary, but it has been found practical to use 10 pounds of the grits to 100 pounds of pork: this percentage maintains the original flavor of pork sausage and its original texture. Many a homemaker has found that she can use far more than 10 per cent of soy grits in meat loaves and patties with excellent results. By this enricher she not only saves meat, but steps up the protein content of the entire loaf for her family and at the same time lowers the cost for the family budget.

The following figures on pork sausage, showing food value increased by the use of soy, were given by A. A. Levinson of the Glidden Company at the Twenty-second Annual Convention of the American Soybean Association at Purdue University, in September, 1942:

Today it is quite important, because of the high price of meat and possible shortages, to attempt to extend meat food products by the use of soya. It has been shown that, in a product containing 87.5 per cent pork and 12.5 per cent soya, the yield of finished food, after processing, whether the food be processed in cans or fried, is from 25 to 40 per cent greater than the yield of an all-pork product. This means that part of the juices and fat that are released from the regular pork product during processing will be held in the meat food product by the soya. 30 to 35 per cent of the protein in the pork and soy sausage will be soy protein when 10 to 12½ per cent of soy is added to the pork. The finished edible portion of the product will, upon chemical analysis, be equal in protein and fat content to the one that did not contain soy—but much more total food value will be consumed for every pound of merchandise *originally* purchased, as the yield per pound of finished food is greater.

It is of interest to see what this means from the standpoint of shipping space—utilization of cans, and more food for the American people. First, the average pork sausage that one would consume in his home would, on the basis of the edible portion consumed, cost from 70 cents to 80 cents per pound. With just a small amount of soy, as mentioned, the edible portion would cost from 50 cents to 65 cents per pound.

In every one million pounds of canned pork sausage—in either the bulk or link form—there is only about 600,000 pounds of edible portion. By the addition of 10 per cent soy, an additional 150,000 pounds of edible portion is made available.

Foods for pets represent another field for soy as a meat substitute and enricher. Thousands of pounds of properly prepared and processed soybeans have been used in canned dog food. The nutritional value of soy makes it an excellent pet food, and its use in such products has been steadily increasing. Today, tasty meatlike dishes can be prepared at home for pets from soy grits. The addition of a small amount of broth, meat stock, or gravy makes them more inviting, and many a dog and cat is going to thrive on his soybean meat.

FORTIFYING FOODS WITH SOY FLOUR

Soy Bread. America as yet does not understand or appreciate the value of soy flour and what it can mean in the human diet.

Soy flour is one of the cheapest foods available to man, when judged from the amount of protein, minerals, especially calcium, vitamins, or even energy obtainable for a unit of money. Only lard, sugar, and corn meal are cheaper sources of energy, and they are not protein foods. Soy flour has been rightly named the "little giant among protein foods" (see Chap. V, page 89). Its greatest value is that it is an easy and inexpensive way to fortify almost any food with extra natural essential food elements.

One great use, and perhaps the greatest, of soy flour on a national scale is in bread.

Soy bread, containing large amounts of soy flour, 10 to 30 per cent, has been on the market for many years and in certain localities has proved very popular. Because of the nongluten content of soy flour, it cannot be used alone for bread but must be mixed with wheat and other flours. A common percentage is 20 per cent soy and 80 per cent wheat flour. The use of 20 per cent soy flour with white flour in breadmaking increases the protein content of the bread over that of ordinary white bread by 40 per cent or more, depending on the type of soy flour used. With whole-wheat flour and soy flour, the increase of protein in the bread over that of regular whole-wheat bread is of the same order. The increase in naturally occurring minerals, due to the use of soy flour, is 120 and 160 per cent, respectively.

On the other hand, the decrease in carbohydrates of bread as the result of using 20 per cent soy flour and 80 per cent wheat flour instead of wheat flour alone or whole-wheat flour is notable, being 17 and 14 per cent, respectively. It is no wonder that soy bread has endeared itself to the hearts of our carbohydrate-conscious citizens.

Table XV.—Composition of Soy Bread
80 per cent wheat—20 per cent soy

Type of flour	Water	Protein	Fat	Carbo- hydrates	Salt- free ash
Wheat flour.....	35.6	8.8	2.6	51.2	0.5
Wheat-flour-soy flour (high-fat).....	36.8	13.2	5.2	42.5	1.1
Wheat-flour-soy flour (low-fat).....	36.8	14.8	2.7	43.8	1.3
Whole wheat.....	37.3	9.1	2.9	47.9	1.5
Whole-wheat-soy flour (high-fat)....	38.2	12.6	5.3	40.9	1.8
Whole-wheat-soy flour (low-fat)....	38.2	14.1	2.8	41.5	2.1

Table XV, which is by Dr. J. A. LeClerc and L. H. Bailey of the Food Research Division, Bureau of Agricultural Chemistry and Engineering, throws some interesting light on the subject.

During the last few months, we have become conscious of the word *enriched*. As a nation, we have spent time, effort, and a vast amount of money in educational work, with very little success, in trying to wean the public away from white bread. Not having been successful, we have turned to enriching, and the demand is for enriched bread, flour, and other products. We often do not stop to think, however, that the enriched products not only are enriched with synthetic vitamins but have only three vitamins and one mineral added when many more of each have been removed by milling.

Men are suffering today from the evils of a refined age. Science admits it and tries to rectify it by enriching foods. But natural food is complex, and so far science has not been able to duplicate it. The whole process might be compared with the story of Humpty Dumpty: All the king's horses and all the king's men could not put Humpty Dumpty, a simple egg, together again. All science cannot put together the vitamin B complex or any of the other natural vitamin complexes as Nature made them. As yet, we do not know all the parts. And there is no doubt that natural, unrefined, and unprocessed foods contain unknown vitamins and other factors. It is doubtful, therefore, if any synthetically enriched product can ever equal the natural.

If we can find a food high in vitamins and minerals that we can use for enriching, so much the better. Our present enrichment program, however, still leaves the bread as deficient in protein value as it was before enrichment. A small amount of soy flour in our white bread would be a great improvement and may be part of the solution of the bread-enrichment problem.

The complete story of what can be done by enriching bread with soy flour was presented by Dr. J. A. LeClerc and Miss Emily Grewe of the Agricultural Chemical Research Division, Bureau of Agricultural Chemistry and Engineering, Agricultural Research Administration, U.S. Department of Agriculture, at the Soybean Association Convention at Purdue University in September, 1942:

Much has been said already about enriched flour and bread. It is not intended to go into the history of this subject in detail. Suffice it is to say

that England, after having considered the pros and cons of this subject for 2 years and more, has finally given up the whole idea of flour enrichment by use of synthetics and has gone on to an 85 per cent wheat-flour extraction basis. Canada and Australia have never favored the use of chemicals to enrich flour but preferred to use some of the millstreams, found to be especially rich in the B vitamins, in addition to and in conjunction with the regular flour. Canada has even gone so far as to stigmatize as "adulterated" any flour to which a synthetic vitamin has been added. This is just the reverse of what the legislatures of two of our Southern states have just done, namely, made it unlawful for anyone to sell white flour, or bread, unless enriched either by the use of synthetic vitamins and iron or, in the case of bread, by the use of yeast that has been thus enriched.

Probably, a still better method to enrich flour is to use, with white flour or whole-wheat flour, some such product as soy flour, peanut flour, cottonseed flour, wheat germ, etc. The use of 20 per cent of soy flour with 80 per cent of clear flour makes a bread which is fully three-fourths as rich in thiamine as is whole-wheat bread, 85 per cent as rich in iron, 70 per cent as rich in phosphorus, and 50 per cent as rich in niacin. Such a bread, made with 6 per cent skim-milk powder, is even richer in calcium and riboflavin than is whole-wheat bread.

Normally, 100 pounds of wheat yields 72 pounds of flour. The losses which result in the milling process are significant, namely, an average of over 80 per cent of the total minerals, besides approximately an equal amount of the vitamins. Wheat contains some 15 to 20 different minerals, depending upon the presence of these elements in the soil. In the process of milling wheat to flour, 70 to 90 per cent of each of these minerals is found in the offal. The enrichment program calls for the addition of one mineral only, namely, iron.

In wheat are found 10 to 12 vitamins of which, so far as our knowledge goes at present, thiamine, niacin, riboflavin, pyridoxin, pantothenic acid, and vitamin E are the most important. Many more vitamins may be discovered in, and isolated from, the wheat in the future. However, according to our present knowledge, from 50 to 95 per cent of each of the known vitamins is removed in milling and is found in the feed. The enrichment program calls for the addition of two vitamins, namely, thiamine and niacin.

The use of wheat germ, soy flour, peanut flour, cottonseed flour, dried yeast, dried skim milk, etc., all rich in B vitamins as well as in minerals, would enrich white flour in a balanced manner, because each of those enriching substances would not only add thiamine, niacin, and iron to a flour deficient in most vitamins and minerals, but all of the minerals and the B vitamins in amounts and in proportions naturally found in those enriching substances.

The amount of calcium, phosphorus, and iron and thiamine, riboflavin, and niacin, present in $\frac{1}{2}$ pound of bread made from patent, clear and whole-wheat flours, as well as from mixtures of 20 per cent soy flour with 80 per cent wheat flour (all bread doughs containing 6 per cent of skim milk solids) has been compared to the daily requirement of these essential food factors. According to the National Research Council, the average adult requires daily 0.8 gram of calcium, 12 milligrams iron, 1.8 milligrams thiamine, 2.7 milligrams riboflavin, 18 milligrams of niacin. Nutritionists generally assumed that approximately 1.5 grams of phosphorus is required daily per adult. On the basis that the average per capita consumption of bread is approximately $\frac{1}{2}$ pound per day, that amount of bread made with 20 per cent soy flour and 80 per cent clear would supply 29 per cent of the calcium, 35 per cent of the phosphorus, 41 per cent of the iron, 33 per cent of the thiamine, 16 per cent of the riboflavin, and 30 per cent of the niacin required per day. One-half pound of bread made from a similar mixture of soy flour and whole-wheat flour would supply 32 per cent of the calcium, 54 per cent of the phosphorus, 59 per cent of the iron, 46 per cent of the thiamine, 18 per cent of the riboflavin, and 56 per cent of the niacin of the daily requirement. In other words, bread containing 20 per cent of soy flour and 80 per cent of clear wheat flour would be approximately 63 per cent richer in calcium than the present patent flour enriched bread, 100 per cent richer in phosphorus, 150 per cent richer in iron, 70 per cent richer in niacin, but only 20 per cent richer in thiamine and 40 per cent richer in riboflavin.

In Table XVI are shown the percentages of the daily requirements of minerals (calcium, phosphorus, and iron) and vitamins (B_1 , B_2 , and niacin).

Not only can very satisfactory and nutritious bread be made from mixtures of 20 per cent soy flour and 80 per cent wheat flour, but, relatively speaking, equally nutritious cake, pie crust, macaroni, pretzels, biscuits, and cookies can likewise be made with such mixtures. Baking-powder biscuits, for example, made from a 50 to 50 mixture of soy flour and clear grade of wheat flour contain over five times as much minerals, including calcium and iron, five times as much thiamine and riboflavin, four times as much phosphorus, and three times as much niacin, as do biscuits made from plain white flour only.

The consumption of soy flour-clear flour bread would supply each year $1\frac{1}{2}$ pounds more minerals than would the ordinary enriched bread, besides $1\frac{1}{4}$ ounces of calcium, $3\frac{1}{2}$ ounces phosphorus, 1.2 grams iron, 48 milligrams thiamine, 54 milligrams riboflavin, and 972 milligrams of niacin. These are appreciable quantities when it is considered that the daily requirement of thiamine is only 1.8 milligrams, that of riboflavin, 2.7 milligrams, and that of niacin, 18 milligrams. These figures become

all the more significant if applied to the 16 to 18 years of the growing period of a child, for during this period most children eat no bread except white bread.

Table XVI.—Percentages of the Daily Requirements* of Minerals and Vitamins in $\frac{1}{2}$ Pound of Bread†

Bread made from	Calcium	Phosphorus	Iron	Vitamin	Vitamin B ₂	Niacin
Plain patent flour.....	17.5	17.2	13.3	9.2	11.9	13.9
Enriched patent flour.....	17.5	17.2	16.6	27.7	11.9	16.0
Optional						
Enriched patent flour.....	35.0	17.2	16.6	27.7	24.0	16.0
Plain clear flour.....	18.6	24.2	27.1	24.5	13.3	24.9
Whole-wheat flour.....	22.4	47.5	48.2	42.3	15.3	59.9
80% plain patent flour, 20% soy flour.....	27.7	29.0	30.9	20.0	15.4	20.4
80% plain clear flour, 20% soy flour	28.6	34.6	41.2	32.7	16.7	29.5
80% whole-wheat flour, 20% soy flour.....	32.1	54.0	58.6	46.4	17.8	56.1

* National Research Council, daily requirement: Ca, 0.8 g. (P, 1.5 g.); Fe, 12 mg.; B₁, 1.8 mg.; B₂, 2.7 mg.; niacin, 18 mg.

† Bread formula: 315 g. flour, or 252 g. flour plus 63 g. soy flour; 19 g. dried skim milk; 8 g. compressed yeast; 6 g. salt; 190 to 220 cubic centimeters water.

After proof such as that in Table XVI by one department of the government, it is hard to understand how another department can question the value of soy flour in white bread and wish to call it an adulterant (see Chap. VIII, page 146).

Other Products. Soy flour can also be used in cakes, cookies, crackers, and all kinds of baked products. Soy crackers already enjoy national distribution, and at the present time demand exceeds supply. One great advantage is that the housewife can use soy flour to fortify anything she bakes or makes to suit the taste and need of her family. Soy flour or grits can also be used in breakfast foods, diabetic foods, infant foods, pancakes and self-rising flours, macaroni, doughnuts, pretzels, *pâté de foie gras*, potted meats, spreads, mayonnaise, soups, confectionery, beverages, coffee substitutes, beer, milk, cheese, and ice cream. All such products, of course, should be properly labeled.

Macaroni. If any group of food products need the addition of soy, it is macaroni, spaghetti, and the other paste products.

These foods are plentiful, cheap, easy to prepare, and popular and are usually served as the main dish of the meal, in spite of the fact that they are comparatively low and incomplete in protein, high in starch, and almost completely lacking in protective elements. Macaroni and cheese is suggested as a protein entree, but as cheese gets more and more scarce it becomes a starchy dish and not a protein.

If $12\frac{1}{2}$ per cent of soy is added to any of the paste products, it will aid in producing a complete protein and increase the total protein intake per dish from 35 to 40 per cent, that is, as much as 5.5 grams per meal.

Soy macaroni, spaghetti, and noodles have been on the market for several years, but so far their sale has been limited to health-food stores or food specialty shops. Here they have proved very popular, and their use has been constantly increasing. There is no reason why all paste products cannot be made more nutritious by the addition of soy flour. Here is one product from which the public can unknowingly reap the benefits of extra vitamins, minerals, and protein and not know the difference in taste. Soy macaroni and paste products are ready for a national program, and no doubt we shall hear the merits of soy extolled by radio and the press.

Cereals. Soy is also a good addition to cereals. The protein in cereal is not a high percentage and is incomplete. When 10 to 20 per cent and even 30 per cent of soy is added, the protein value is greatly increased and made more complete. In the case, for example, of farina, the addition of 20 per cent of soy increased the protein content of the finished cereal from approximately 14 to 21 per cent. Soy cereals already are popular sellers, and again their debut has been made through little health-food stores. Some soy cereals are 100 per cent soy, and others are fortified with only a small amount of soy grits. One advantage is that the housewife can secure different kinds of soy grits and can fortify any cereal as she sees fit (see Cereal Recipes, page 246).

Corn meal is one cereal in which the addition of soy is a decided benefit. Corn is one of the most incomplete of the grains as to protein; and yet fried corn-meal mush is not only a popular dish with many but is often a main dish on the family menu. Dietary deficiencies are bound to result from a lack of good proteins and essential vitamins and minerals. The Chinese

fortify their rice and grains with soy, and we can do the same. The diet of the Mexican Indian is one example of this problem in our modern world (see Chap. II, page 26).

Pancakes and Waffles. Americans have been both criticized and ridiculed for their fondness for stacks of wheat cakes. If, however, these cakes are well fortified with soy flour, they will contain a good amount of nutritious protein. Soy waffle, pancake, and muffin mixtures have been popular items in health-food stores for years, and they merit popularity for both taste and food value. The soy adds a delicious almost nutlike flavor that gives additional taste appeal. Soy-enriched muffin, pancake, and waffle flours are now appearing in up-to-date markets, and their immediate popularity has astonished many a skeptical grocer.

Soups. Another field for soy enriching is the American start of a meal—soup. The war has enlarged the soup market, and every type imaginable is now spread over the grocer's shelf in handy containers. One of the latest arrivals is an instant soy soup.

Large amounts of concentrated soups have been purchased by Lend-Lease. These have contained moderate quantities of soy flour and grits, and packers are making them for domestic use as well. A moderate amount of soy helps to produce a soup that has a desirable body and, of course, increased nutritional value. A bowl of such soup produces a feeling of satisfaction, that the soup was a nourishing one. Tasty and quickly prepared soy soups will always be staple items in the food field.

So the nutritional stage is set for the humble soybean. Once again it is called upon to play a vital role in a food crisis, and, as in ancient days, it is not found wanting. This time, however, fortified by modern research and the labors of science, it is equipped for a tremendous job in a world depleted by war. The importance of this little Oriental nugget can hardly be exaggerated. The sooner America learns to use the soybean as a common food and enjoys the benefits of its nutritional wealth, the better it will be for the health of her citizens born and unborn.

Chapter V

From Soup to Nuts

HAD your soybeans today? The chances are that you cannot answer; because we never know how, when, where, and in what form we are going to meet this ever-changing bean. Monotony will never be descriptive of this food. It may be used green, dry, whole, cracked, powdered, or sprouted, and as meat, milk, cheese, bread, or oil, with coffee, candy, and nuts thrown in for good measure. It may start or end a meal or be the main part if so desired. Hence the phrase "from soup to nuts" is fitting and descriptive of our versatile heritage from the Orient.

GREEN BEANS

When the beans have reached nearly full size but are still green and succulent, they make a most palatable, nutritious green vegetable, one that will rival lima beans once it is known. The average American knows nothing of the green soybeans unless he has accidentally stumbled on a can, been given some green ones to try, or has had them purposely included in his diet. Agricultural stations and growers, when making palatability tests, tried them out in markets, institutions, hotels, and the like; and invariably the response was a request for more, with suggestions and directions on how to use them. Green soybeans are certain to become a common American vegetable, and the

next few years will bring us improved garden seeds suitable for various locations and soils and American tastes.

According to the Agricultural Experiment Station, University of Illinois (*Bulletin 443*), the composition and fuel value of the average green soybean are

70	per cent water
12.25	per cent protein
5.22	per cent fat
11.07	per cent total carbohydrates (by difference)
1.30	per cent fiber
4.18	per cent sugars
1.52	per cent ash
636	calories per pound

Green soybeans are very low in starch (6 per cent in nutritionally available carbohydrates), high in protein, and a good source of minerals; and they contain vitamins A, B₁, B₂, other vitamin B factors, and vitamin C (see Chap. IV, page 57).

When the green beans are used as a vegetable or for canning, they should be picked when the pods are plump and green, before the pods start to turn yellow. Most varieties remain in the edible stage 10 days, some twice that long. The beans should be handled quickly after picking, within an hour or two, either for freezing or for canning, because they begin to lose some of their sugar and with it their flavor almost immediately. This was something the commercial canners had to learn. The beans must be picked at the right time for the best flavor, color, and tenderness.

The stumbling block with green beans is that they are hard to shell; and, to simplify matters, the pods should be plunged into boiling water for a few minutes. The Iowa Experimental Station has found that covering the pods with boiling water and boiling for 5 minutes cuts the shelling time almost in half. The Illinois station suggests pouring boiling water over the beans and allowing them to stand for 5 minutes. Soybean pods are tough and hairy, containing two to four beans depending upon the variety. The beans can then be shelled out by holding the pod between the thumb and forefinger with the longer side up, snapping it in two crosswise, and squeezing the beans out of each half. Another method is to hold the pod between the thumb and forefinger and squeeze out the beans by bursting the

pod open. The average yield of 1 pound of beans in the pod is $\frac{1}{2}$ pound of shelled beans.

The green shelled beans may be boiled or steamed like other beans, or they may be cooked a few minutes in a pressure cooker. The time of cooking varies with the method of cooking and the variety of bean. Some cook as quickly as peas; others are more like lima beans. The best varieties are not mealy when done and retain their green color. They are rich in themselves and need only simple seasoning.

Green soybeans are high in food value, averaging about 12 per cent protein, and are very good served by themselves as beans; or they may be used to fortify other foods. They are excellent in soups, chile con carne, succotash, scalloped dishes and salads (see recipes, page 184).

If desired, the beans may be served in the Oriental manner by cooking the pods in salted water and then eating them very much as we eat an artichoke. The pods are picked up with the fingers and dipped into melted butter and soy sauce, and the beans are extracted as gracefully as possible.

Green soybeans may be successfully canned at home in the steam pressure cooker. The time required is approximately the same as for peas. Complete directions are given in *Farmers' Bulletin* 1762, Home Canning of Fruits, Vegetables and Meats, U.S. Department of Agriculture. Nutritionists at the Iowa Agricultural Experimental Station suggests $\frac{1}{2}$ to 1 teaspoonful of sugar and 1 teaspoon of salt per pint for the best flavor. They also recommend 60 minutes in the pressure cooker at 10 pounds pressure for canning the beans.

Commercially canned green soybeans have been on the market for several years, but as yet few have reached the shelves of the average grocery store. Those who use them like them and come back for more. Again, the handicap has been that the average housewife has not come in contact with these beans and does not know what they are or how to use them.

Fresh and canned green soy beans are excellent for the starch-restricted diet because of their low carbohydrate content. They are a welcome addition to the limited list of low starchy vegetables and are far more nutritious than most of them. They can be used on such a diet when lima beans cannot, and many

specialty food concerns have included them in their merchandise for this reason.

One successful commercial canner of green soybeans is the Fox Valley Canning Company of Wisconsin. Mr. W. L. Schroder has been interested in canning them since 1930, after learning of their value as a food for the Chinese. He says that they planted a common field variety the first year, but no one could eat them. Their problem then was to find an early edible variety that would mature in the short Wisconsin growing season. This was accomplished through the aid of the U.S. Department of Agriculture and the University of Wisconsin. Next, they had to find an efficient way to thresh or shell the green beans. Mr. Schroder says that they now have 1,000 acres planted for canning. He also says, "It has taken time to see if the American public would like the green soybean and now it has won its market with the consumer."

Every pioneer in the soy industry can tell the same story. It has taken not only time but effort, perseverance, and faith in the little bean to enable it to secure a toehold in our diet.

Another pioneer in the canning of green soybeans, and in many other soy food products as well, is Dr. H. W. Miller of the International Nutrition Laboratory, Mount Vernon, Ohio. This concern grows, shells, and cans its edible green soybeans and distributes them to practically every health-food store in this country. Still another pioneer is R. P. Schmidt, now of the Nutrisoy Company, New York, N.Y.

The Iowa Agricultural Experiment Station has been experimenting on four well-known edible types for freezing, and their research proves that green soybeans rank high as a frozen vegetable. The method of harvesting, cleaning, shelling, and scalding is similar to that for lima beans, except that, after shelling, several rinsings are needed to remove attached seed membranes. The result is a frozen bean resembling a green lima bean, but richer in flavor, with good color and firm, tender texture.

The University of Illinois has found that freezing is more successful than canning in retaining flavor and color. They suggest precooking the beans in boiling water for $\frac{1}{2}$ minute after shelling to stop enzyme action and deterioration in flavor and color during storage. The precooked beans are plunged

into cold water to cool quickly, then drained and packed in tight containers. When the beans are taken out of storage, they are plunged still frozen into boiling water and cooked with the addition of salt. If allowed to thaw first, they should be cooked as soon as the ice disappears. We shall no doubt soon be enjoying green soybeans. They are worth a trial both in the garden and on the table.

DRY BEANS

Dry soybeans are the mature beans, removed from the pods. The edible types vary in size and color, most of them being large and medium in size, and they are usually yellow, greenish-yellow, or gray-green in color. The beans should be harvested as soon as the pods have turned to the mature color and become fairly dry. If the plants are cut at the right time, the beans will be full and will not wrinkle or mold. If the pods are left on the vine too long, there is an excessive loss by shattering, especially with some varieties.

Because of their high protein content, dry soybeans require long cooking. This makes them different from other dry beans. Many cooks who try them for the first time are likely to lose enthusiasm when they find that after several hours of cooking the beans are still hard and unpalatable. Some of the victory recipes first released suggesting 2 hours of cooking for soybeans or saying that they can be cooked like other beans only disillusion the housewife and spoil the reputation of an excellent food.

The dry beans can be cooked at home and are delicious when thoroughly done and properly seasoned. The cooking time varies with the variety of the bean, but it will be several hours in the ordinary pan, and it is always wise to soak the beans first. Some cooks prefer soaking them for 24 hours or more, keeping them in the refrigerator to prevent fermentation.

The easiest and quickest method of cooking is in the pressure cooker, and the soaked beans will be soft and tender in 15 to 40 minutes. In the ordinary pan, the beans must be simmered several hours or partly cooked and then baked until done. Grinding the beans after they are soaked lessens the time of cooking, and they are excellent this way for soup and meat-substitute dishes. Tenderized soybeans, which cook in a short

time, are also on the market and can be added to soups in place of meat.

The secret of any tasty soybean dish is the right seasoning, for the beans in themselves are rather flat tasting and need a little peppering up with ham, bacon, soy sauce, meatlike seasonings, onions, or tomatoes. The vegetarians usually add some meatlike flavorings that may be purchased in liquid, paste, or powder form. The new kitchen yeast (brewer's yeast with beef-steak flavor) may be used with excellent results. It also adds extra vitamin B.

It should always be remembered that soybeans are a concentrated, nutritious food and should be used as such. Often the person trying them for the first time is likely to overeat or to use them as an extra vegetable with an already heavy meal. It is no wonder if he says that they are too heavy a food or hard to digest. The chances are that it is not the fault of the beans; it is more likely to be the quantity or the company that is to blame. Soybeans should be used like meat, fish, or any other heavy protein and are best when balanced with low starchy vegetables both raw and cooked. Delicious meatlike entrees can be made from the inexpensive whole dry soybeans (see Recipes, page 200) that will please the most fastidious family.

FROZEN BEANS

The latest development is the frozen dry soybean. The beans are soaked several hours and then quickly frozen. They now can be used as a fresh vegetable and the cooking time is approximately 1 hour. Frozen dry soybeans are now being distributed by some of the frozen food concerns.

ROASTED SOYBEANS

This novel food, resembling salted peanuts, has become very popular in the last few months via other channels than the regular food store and is known as salted, toasted, or roasted soybeans. They are usually deep-fat fried, then salted; and they will stay fresh and crisp for a long time if kept in an airtight container. They are delicious with drinks or fruits and may be used like any salted nut, either whole or ground. When ground, they are a good addition to cookies, cakes, crackers, and desserts.

The toasted beans will be a keen rival of the salted peanut and are preferred by many because of their alkaline ash.

Toasted soybeans are easily prepared at home by first soaking the beans overnight, then draining and frying them in deep fat for a few minutes. Those who do not approve of deep-fat frying can roast them in the oven (see Recipes, page 200).

SPROUTED SOYBEANS

Soy sprouts are news. They have already been featured in articles in *Life*, *The Reader's Digest*, and many other well-known



FIG. 5.—Sprouted soybeans. (Louise Boyle.)

magazines. The sudden limelight of the sprouted soy is enough to make the soy pioneer and some of the slighted nutritionists rub their eyes in amazement. The Chinese have used bean sprouts for years, and they are grown in the Oriental sections of our country. Many nutritionists and well-known students of food have advocated bean sprouts for years and faced ridicule because of their beliefs. Brown Landone, well known for his theories and writings on effective living, for instance, has stressed

the nutritional value of sprouted beans for many years. It often takes a war, a catastrophe, or a dire emergency to make us realize the values and possibilities of everyday and simple things.

Dr. Clive M. McCay, of the School of Nutrition at Cornell University, believes that the sprouted soybean can be one answer to a meat-shortage problem. Dr. McCay has worked on the problem of meat substitutes for several months with Dr. Peng Chen Hsu, a Chinese student at Cornell University. Their findings were presented at a soybean luncheon given by Governor and Mrs. Thomas Dewey in the executive mansion at Albany, N.Y. Dr. McCay said:

Soybeans rival meat in nutritive value. They can provide more vitamin C than tomatoes. They can be prepared without waste and can be cooked with as little fuel and as quickly as a lamb chop.

Both Dr. McCay and Dr. Peng Chen Hsu maintain that the big job in this country is in educating and familiarizing the people with soybeans and developing a liking for them. They say that it takes only a few meals for the average person to develop a taste for them.

The governor's luncheon marked the beginning of a campaign to promote soybeans and soy sprouts as a standard food in our diet. When it became apparent that the residents of New York would, like the rest of the nation, be faced with a shortage of essential foods, Governor Dewey appointed an emergency food commission to prepare a wartime program. In their first report, they stressed the value of soybeans and soy sprouts.

The great value of soybean sprouts is that they are a nutritious protein food. They are also an excellent source of vitamin C and can take the place of fresh vegetables in the diet. Sprouting changes the bean from a dry to a fresh vegetable, and the sprouted bean contains all the vitamin B complex of the original bean plus the valuable vitamin C that forms in all sprouted foods. There is some evidence that sprouting increases the riboflavin and niacin contents and that vitamin A is liberated for more nutritive value. Dr. Francis Pottenger, Jr., Monrovia, Calif., believes the sprouted soy is the best way of using the bean, and that in this form it is a true substitute for meat.

Bean sprouts are not an unusual vegetable in many large markets on the West coast. Mung beans have been commonly

used for sprouting; but soybeans of the field or edible variety will yield tender delicious sprouts with far more food value. Already progressive merchants are selling soy sprouts. Still basking in their recent publicity, the sprouts tempt the curiosity of the customer, and a sale is made.

One great value of the sprout is that the dry bean may be kept for months and then added to water to produce a food with the value of a fresh vegetable. Here soybeans offer big possibilities for shipping abroad for the prevention of scurvy, whether in arid regions or in the Arctic Circle. A small quantity of beans, with instructions on how to sprout them, can be included in emergency rations either at home or abroad.

Work is also under way on the freezing and drying of bean sprouts, and this opens up still another field of possibilities.

Soy sprouts can easily be prepared at home with no more extra expense than that of few beans, a covered container, and water. The Emergency Food Commission in New York suggested sprouting them in milk bottles and the use of chlorinated lime to prevent mold. The U.S. Department of Agriculture leaflets 166 and 534 (see pages 4 and 12) suggest sprouting them in a flower pot, a sink strainer, or any container that has holes in it and can be covered. The beans should be soaked overnight and then placed in the container, covered, and set in a moderately warm place. They must be kept moist and flooded with water four or five times a day. An old-fashioned colander may be used and set in a mixing bowl to catch any dripping water. Topped with a light cover, the beans will have the necessary darkness and can easily be flooded with water several times a day.

It is not necessary to use chlorinated lime to prevent mold if the beans are kept at a moderate temperature, the container is absolutely clean, and the sprouts receive a sufficient amount of air. Considerable carbon dioxide is formed in the process of sprouting, and the beans need proper ventilation. Highly glazed or enamel containers are excellent because they are easily cleaned. Soybeans can also be sprouted in trays used for the sprouting of corn and grain for animal feeds.

In 4 to 6 days, the tender crisp sprouts will be 2 inches long and are ready to be used, either cooked or raw. Seasoned and sautéed, they serve as an entree, or they may be mixed with

vegetables or added to stews, soups, or casserole dishes. Raw, they are an excellent addition to salads (see Sprout Recipes, page 194).

To all who desire information, the Emergency Food Commission, War Information Service, 80 Centre Street, Albany, N.Y., will send a free pamphlet with recipes and instructions on how to sprout soybeans. Through the courtesy of the commission, these instructions are also printed on page 192 of this book.

The New York Commission says that mass production of the sprouts offers no serious problem, for cheap processes can be developed for creameries, canneries, and other established manufactories. The Chinese and Japanese have been growing bean sprouts in quantities in this country for many years. A trip through a bean-sprout factory is both fascinating and enlightening. The beans triple in weight and quadruple in bulk, literally pushing themselves out of the containers used for sprouting.

THE COW OF CHINA—SOY MILK

Necessity is the mother of invention, and many a Chinese has never tasted any milk other than that of the soybean. It has been the cow of China for centuries, and soy milk is still a staple food for Chinese infants and adults. About three years ago, an American-educated Chinese girl opened a soybean dairy at Kutsing, a refugee center deep in the heart of China. This was sponsored by the China Child Welfare, Inc., of New York.

Soy milk is one of the most unusual and interesting of foods. The first question that enters our heads is, "How does one milk a soybean?" It seems peculiar that this little hard nugget can yield a white milk, but grinding a few well-soaked beans gives immediate proof. Soy milk is made by soaking, grinding, and boiling the dry beans, and then straining off the liquid. This milklike solution is not very palatable. Until recently, little has been done to overcome the raw, slightly bitter taste except to add cinnamon and other flavors plus a little sweetening.

In spite of its poor taste, nevertheless, soy milk has been used because of its abundant supply of energy-yielding materials. The value of this food has long been recognized as a milk substi-

tute in the feeding of infant children and the aged, feeble, and debilitated. Its general use has never been popularized, nor has its great value as a food been appreciated or set before the public.

Today, the handicap of unpalatability has been conquered both in the United States and in China. This has been done by physical rather than chemical methods and by a process that in no way denatures the protein, affects its solubility, or in any way detracts from the splendid food value of the original milk. This has not been done by adding to or disguising but rather by removing all unpleasant odors and bitterish tastes so that the soy milk is sweet, pleasant, rather nutlike in flavor and not greatly different from pasteurized dairy milk. Food elements have been added to make it equal to cow's milk in food value and, in some cases, equal to mother's milk. This milk is now sold in cans under the name of soy milk or various trade names.

Canned soy milk is creamy in color and looks like ordinary canned milk. It keeps as well. The usual formulas have added sweetening, in the form of dextrose and maltose, and added fat, calcium, and phosphorus to provide the same food value as ordinary dairy milk. Vitamin D may or may not be added. Canned soy milk is also homogenized to stabilize its creamy consistency.

So far canned soy milk has not been a common item of food, and few concerns have been interested in its manufacture. Those willing to bother with "the bean milk," as it has often been called, have been the Seventh-day Adventists and special dietary concerns. Their products so far have reached only the health-food stores and specialty shops. That it has merit is proved by the fact that one of our largest dairy concerns now manufactures what it calls an emulsified soybean food for dietary purposes and dispenses it through drugstores. The great use of soybean milk has been for special diets, allergy diets and the like, but it can be used by anyone. As it becomes better known, it will no doubt have more converts and will be sold in the ordinary food store.

Soy milk will perhaps never be a popular or a common food in the American diet in normal times. With our abundant milk supply, there is no reason why it should be. Its sale and use, however, are steadily increasing; and, in some instances, demands have already exceeded production.

It is noteworthy, however, that the dairy industry has realized the value and possibilities of soy milk; and through their efforts some states require that it be labeled imitation milk and that the dealer pay for a special license for selling it. This has naturally curtailed the selling of soy milk in many small stores; because it sells very slowly, the sales are not enough to warrant the paying of a license. Such discriminatory regulations also bring about higher prices. California, for instance, requires that a manufacturer pay \$100 license fee, a wholesaler \$50, and a retailer, no matter how small, \$5 for the privilege of making or selling soy milk. The Soybean Association naturally is trying to combat such laws, and their argument is that Webster's dictionary recognizes vegetable as well as animal milk, that soy milk is not an imitation milk, but a product of the soybean sold on its own merits (see Chap. VIII, page 146).

Products known as powdered soy milk and soy milk powder have made their appearance and in several instances have been more popular than liquid soy milk. Most of these so-called "milks," however, are nothing but very finely ground full-fat or low-fat flours, and the Pure Food and Drug Administration recently ruled that they must be sold under a trade name and not as soy milks. These flours are usually sweetened and flavored, and some of them are fortified with such minerals as calcium and phosphorus. Many of them make a delicious drink with milk or water, and they can be added to juices. Products of this kind are an excellent and easy way to add extra nourishment to the diet and often are the base of many so-called "soy malts" and other beverages to be made with milk.

A soy powder can be made by spray process from soy milk. At present, the only concern making such a product in this country is the International Nutrition Laboratory, Mount Vernon, Ohio. Their powder is sold under the name of Soyalac and is fortified with sweetening, vegetable oil, and minerals.

The greatest need and value of soy milk is in the milk allergy diet and other special diets. It has proved a lifesaver to many babies when other milk formulas would not agree. The babies not only thrive on it; they relish it! The use of soy milk is yet in its beginning in this country, and though it will perhaps never be widely used by the average individual, its use will increase in the dietary field as doctors and nutritionists become more

familiar with it and realize its marvelous values and possibilities (see Chap. VII, page 125, and Soy Milk Recipes, page 236).

THE MEAT WITHOUT A BONE—TOFU OR SOY CHEESE

Anyone interested in unusual and different foods will be fascinated by tofu, the soy cheese, more commonly known as bean curd. It is a soft, almost custardlike white cheese made from soy milk, definitely un-American in flavor; and it is a common food in the diet of the Chinese and Japanese. Fresh tofu can always be had in sections of the country with a high Oriental population. The Chinese have aptly described it as "the meat without a bone." It is the soft white substance that we find in their soups or stews, or served with meat and gravy.

Tofu is a coagulated plant casein of the soybean, made from soy milk, very much as we make cottage cheese. It is a soft, easily digested food, fairly high in protein; and it can be used as cheese, as a meat or fish substitute, or even as a dessert. When fresh, it is a tasteless product, decidedly flat and watery; but, when properly prepared and seasoned, it is delicious and different. It is practically unknown to the white race, and what little has been used by them has been through curiosity or for a special diet. It is an excellent and inexpensive food; but even so it is one that will never be very popular in this country, because the average American is not going to take the time or trouble to acquire a taste for it.

To make the cheese, the soy milk is allowed to curdle, and best results are obtained when a small amount of mineral salts or acid is added. After the curds are formed, the liquid is strained or run through cheesecloth, and the curds are pressed into a cake. The size of the cake varies. It may be a wobbly cube of 4 inches, or one 4 inches square and only 1 or 2 inches in thickness. The cakes usually sell for 10 cents each and will serve two to four people.

Every Chinatown has its tofu factory or factories that run along without fame or publicity, unknown to the average American—the Old World working in the midst of the New—making an ancient food that is still novel to us. There is just such a one hidden away in the heart of Los Angeles, run by two old Chinese who grunt at curious visitors and can't be bothered to answer questions. The methods of these two Chinese are

both crude and primitive, yet they produce an excellent cake of cheese or tofu. In another part of the same city, a Korean has found a market for a firmer cheese and is already packaging and selling it to some of the best known restaurants of Hollywood, where it is served as soybean curd or custard. A few specialty food shops, catering to needs of persons who are on unusual diets by either force or choice, are stocking the fresh soy cheese. A short time ago, tofu had absolutely no chance outside the Chinese market and restaurant; but wars give us unusual conditions and unusual foods as well.

Fresh tofu is perishable and will not keep any length of time. The Oriental markets usually have the soft cakes submerged in water three or four layers deep in a tin box on the floor, and the clerk fishes out a dripping cake as skillfully as possible. He transfers it to an oyster bucket or an old-fashioned lard tray, where it continues to drip. If the container is not waterproof, a trickle of whitish water will soon escape from the package, much to the distress of the purchaser. If the cake of cheese is not to be used right away, it should be stored in the refrigerator or returned again to a bath of cold water. The firmer cakes can be wrapped and kept under refrigeration.

Fresh tofu contains approximately

- 80 per cent water
- 10 per cent protein
- 5 per cent carbohydrate
- 4 per cent fat
- 1 per cent ash or mineral matter

Many a vegetarian enjoys this unusual food as a meat or fish substitute. If he has cultivated a taste for it, he may serve it raw, mashed, and seasoned with a little salt, or sweetened and disguised as a dessert or even as a topping in place of whipped cream. Raw tofu is flabby and watery but takes on a firmer body when steamed or boiled in cheesecloth. After it is cooked, it may be sliced, browned in fat or butter, seasoned with soy sauce or any meat or meatlike seasoning, and served as a protein entree. It definitely needs peppering up of some kind as to flavor. The addition of tomatoes, onions, even garlic, green peppers, or pimiento gives the finishing touch along with the soy sauce or the meatlike flavoring. Many vegetarian restaurants serve soy-

cheese croquettes, and they have always been very popular when prepared by a good chef.

It is not necessary to cook the cheese, however; it may be mashed and seasoned and served as a spread or as cottage cheese. Mashed, sweetened, flavored, and combined with fruit, baked apples, and the like, it becomes a dessert. Some ingenious cooks even use it for cheesecake and as a topping.

Very little fresh tofu is used by the average individual; in fact only the food-curious know that it exists. More perhaps is sold in canned form under the name of soy cheese, soy food, or soy curd. A few concerns, specializing only in soy products, do can the cheese, in spite of its limited sale. Canned, the cheese resembles the farmer-style, or dry-curd, cottage cheese in texture but has a flavor all its own. Soy sauce, meatlike seasonings, or pimientos are added in canning; and each brand varies as to taste, texture, and moisture. A new product called vegetable cheese is a combination of peanuts and soy curd.

Canned tofu may be used like any soft cheese for sandwich spreads, salads, stuffed tomatoes, and so on; and it may be added to salad dressings. Sliced, it may serve as a meat or fish dish; and again the flavor is improved by the addition of onions, chives, or tomatoes.

Tofu is one of the most interesting forms of the soybean; and, though only an optimist would predict its becoming a popular American food, it is worth knowing about and trying at least once (see Tofu Recipes, page 239).

THE LITTLE GIANT AMONG PROTEIN FOODS—SOY FLOUR

The best known and the most valuable product of the versatile soybean is soy flour. In spite of the fact that the soybean has been the nutritional backbone of the Orient, the flour is largely an Occidental product. The Chinese have used their stone mills for wheat, corn, and other grains, and not for the soybean. Soy flour had its beginning in Vienna under the guidance of Dr. Laszlo Berczeller, who saw its possibilities as a cheap nutritious food for the starving people of Europe.

Germany perhaps has done more with soy flour than any other nation of Europe; and it is in the development of soy flour that we have added the American touch to the ancient bean. It is the soy product that will prove the most valuable to us—a food

of the future. This product, an achievement of nature and science, will mean better nutrition for the entire world.

Soy flour, truly speaking, is not a flour in the sense that wheat and rye flours are. It is better described as a highly concentrated vegetable protein food derived from soybeans; and it is more nearly comparable in concentration of food value and in use to dry powdered milk or dry powdered eggs. One glance at the list below (courtesy of Soy Flour Association) is proof of its right to reign as king of the proteins.

Soy Flour

The Little Giant Among Protein Foods

(65 to 100 grams of protein per day are normally required)

	Grams of Protein per Pound of Food
Low-fat soy flour (or grits).....	225
Full-fat soy flour (or bean meats).....	182
Peanut butter.....	118
American cheese.....	109
Navy beans.....	100
Lean beefsteak.....	90
Halibut.....	86
Lean pork chops.....	82
Salmon.....	80
Frankfurters.....	68
Eggs.....	59
Pork sausage.....	54
Pecan meats.....	43

Soy flour compared with patent wheat flour is 15 times as rich in calcium, 7 times as rich in phosphorus, 10 times as rich in iron, 10 times as rich in thiamine, 9 times as rich in riboflavin, and 5 times as rich in niacin, besides being 4 to 5 times as rich in total minerals.

No doubt soy flour, in some form or other, has been known and used to a certain extent for centuries. The edible soy flour of today, on the contrary, is quite different from the meal or flour made from the whole ground beans. It should never be confused with the soybean meal or soybean-oil meal used for livestock and poultry feeds.

The livestock feeds are made from the general run of mature, green, and cracked beans from the field and are not satisfactory in either flavor or other characteristics for human consumption. The edible soy flour is produced in modern sanitary food plants

from carefully selected beans that have been dehulled and from which the beany bitterness has been removed, with the oil retained or removed as desired.

It is interesting to note that the first soy flour made in this country was called "health flour." This product was made by processors in Decatur, Ill., in 1926 and was a fine powder obtained by sifting expeller-process soybean-oil meal. Around 1929, a process was developed and patented for de-bittering the soybean under vacuum. After further processing, it produced a palatable, edible soy flour light in color. About the same time, an edible full-fat flour was produced in Nutley, N.J., based on the Berczeller method of processing.

Today we have two general types of soy flour: full-fat flour and low-fat flour. The full-fat flour contains all the natural fat of the soybean, that is, approximately 20 per cent. This flour has an extremely high calorie content, because of its large percentage of fat, and contains 40 to 45 per cent of protein. The low-fat flour is the same product but with much or practically all of the fat removed. Some varieties contain as little as less than 1 per cent of fat, while others have 5 to 7 per cent of the fat remaining. The concentration of protein is higher in the low-fat flour, ranging from 47 to 53 per cent, and is of a very high order of digestibility. Full-fat and low-fat flours are largely interchangeable in recipes.

Table XVII gives some typical average analyses of the flours.

Table XVII

	Full-fat flour	Low-fat flour	Very low fat flour
Moisture, per cent.....	3.5- 5.5	3 - 5	5.5- 7
Protein, per cent.....	40 -42	49 -52	52 -54
Fiber, per cent.....	2.5- 3	2.5- 3	2 - 3
Ash, per cent.....	5 - 5.5	5 - 5.5	5 - 6
Fat, per cent.....	20 -23	6 - 8	0.5- 1.5
N.F.E. (nonstarchy) material, per cent	24 -25	29 -30	31 -32
Calories per 100 g.....	464	380	344

America does not as yet understand or appreciate the value of soy flour and what it can mean in the human diet. This flour is the richest in protein of all known foods except dried egg whites,

and it is one of the richest sources per pound of the entire vitamin B complex. It has a very high content of calcium, phosphorus, and potassium, as well as liberal supplies of copper, magnesium, and available iron. The full-fat flour also contains lecithin. Soy flour is almost starch-free and gives an appreciable alkaline reaction. In addition to all this, it is the lowest in cost of any of the common protein foods.

The uses of soy flour are many, and it appears in many unexpected places and products. The candy industry uses it in fudge, caramels, kisses, and crunch-type candies in percentages of from 3 to 10 per cent to aid in better emulsification of the fats in the candy and to prevent the drying out of the finished product. It is a natural product for dietary foods and, because of its low starch content and alkaline ash, has been used by this industry for many years. It is also used in many infant foods and special foods for the soft diet. The brewing industry has been trying it out as a foam stabilizer in the manufacture of beer. The baking industry has discovered it to be an excellent addition to sweet goods, cakes, piecrust, doughnuts, and so forth, as well as to bread and rolls. It has found its way into macaroni, noodles, and spaghetti, and many of the ready-prepared soups. Muffin, biscuit, pancake, and waffle mixes with soy are now on the market and are proving very popular. The meat industry has made substantial use of it in meat loaves and meat products where it is not prohibited by law (see Chap. VIII, page 145).

Concentrated foods and army rations open up an entirely new field that can be carried over to mass feeding if necessary. Compact 3-day emergency kits that can be used for mass or emergency feeding are in the making, and we can be certain that one of the ingredients included is soy flour.

Soy bread is the best known and the most widely used of all the soy-flour products, and it is sold in many grocery stores; but even so its use so far has been more or less restricted to certain areas, and it has been consumed only in small quantities. A small amount of soy bread has been on the market ever since the making of soy flour. Bill Baker of Ojai, Calif., famous for his sugar artistry and his "White House cakes" (he sent the President an elaborately decorated fruitcake every Christmas for many years), was one of the early pioneers in soy bread, and his efforts have done much to establish it in the American diet. About fifteen

years ago, Mr. Baker started making a few loaves of soybean bread for special diet cases. The results convinced him of its nutritional value, and he set out to make a loaf that would have universal appeal. Today his establishment devotes its entire time to the making of soy- and lima-bean products and ships them to all the major cities of the West. Even now, the bread is shipped as far east as Chicago; before the war it was sent as far as New York, Hawaii, and Alaska. The Bill Baker bread contains more soy flour than the average loaf of soy bread, and its only sweetening is honey.

Bill Baker and his devotion to soy products have put the little city of Ojai, Calif., on the map. He had first to perfect his formula and then to convince doctors, grocers, and the general public of its merit. It is one of the ironies of fate that Bill Baker could not live to see the fulfillment of his prophecies.

There are any number of soy breads on the market today, and they vary as to taste, texture, and color. Some bakers use very little soy flour, the average being from 12 to 20 per cent, and some add gluten flour. This type, called soy gluten, is excellent for the low-starch diet. Soy toast and soy crackers are now common items in the ordinary market.

The commercial baker often has added soy flour to his bread not because of its food value or as an enricher but rather to enhance the flavor, defer staleness, and maintain moisture. From now on, if he is alert and abreast of the times, he will make a good loaf of soy bread and will advertise it as a bread that has been enriched with extra protein and natural vitamins and minerals.

Soy flour is creamy yellow in color, rather nutty in taste, and is fascinating to work with. Like wheat flour, it should be sifted before measuring. It is fluffy, lighter than wheat flour, one cupful weighing about 75 grams as compared with 100 grams for soft wheat flour or 113 grams for hard wheat flour. Soy flour takes up more moisture than wheat flour and, as a result, has the advantage of giving a moist product that keeps fresh a long time. A little more salt should be used with soy flour. It cannot be used alone for bread, because it has no gluten or starch to bind the mixture together, nor will it replace wheat flour in thickening sauces and gravies. Foods containing soy brown easily and should be baked at a slightly lower temperature.

The Soy Flour Association suggests that soy flour be added in small amounts as one would add eggs or milk. Two tablespoons of the flour in each cup of wheat flour makes a mix that can be used in practically every recipe. Excellent results can be obtained, however, by using much more soy flour—20, 30, even 50 per cent may be used in some recipes. Muffins and pancakes can be made from all soy flour if so desired. The result naturally is not so light and tasty as when part soy is used, but these recipes are often wanted for certain special diets. Frequently the 100 per cent soy flour products, usually containing eggs and milk, are suggested in place of meat and fish in the diet. There is no special trick to using soy flour in baking. The secret is to follow directions on the package, because soy flours vary in fat content.

Soy flour is now featured in a national educational program, and as a result carefully prepared and attractive packages with recipes are appearing on every grocer's shelf. The A. E. Staley Manufacturing Company, Decatur, Ill., a true pioneer of the soy industry, was one of the first concerns to package soy flour attractively for national distribution in grocery stores. Their complete soy-flour cookbook of 48 pages, attractively illustrated, is something every progressive housewife should own. Up till now, the sale of soy flour has been limited to the health-food store, where most of it has been sold in bulk. Here the average housewife seldom came in contact with the flour; and, if she did, she found very little literature to interest her in it, as well as few recipes to tempt her to try it. A short while ago, only one large processor was interested in packaging soy flour for the housewife, but now other processors are giving serious thought to this method of distribution. Several jobbers, however, are packaging soy flour in attractive packages under their own label.

In January, 1943, the Soy Flour Association opened a soy kitchen in Chicago for the promotion of soy flour and soy grits. It is under the able direction of capable, experienced home economists; and their efforts no doubt will be a great help in educating the public to the practical uses of soy flour. The association suggests adding it to everyday foods whenever possible. They say that a can of peas thickly creamed with soy flour provides a natural blend of flavors, with the result of practically doubling the protein value in the can of peas. This association has compiled a booklet on "How to Use Soy Flour" with several

recipes in household quantities for nutritionists and other food specialists.

Soy flour is one of our vital foods and is destined for great popularity in the future. It is a valuable fortifying food for the housewife, one that she can use in a hundred and one ways with a minimum amount of trouble and expense and one that need not announce its presence.

SOY GRITS

These granules, as soy flour, carry the highest concentration of muscle- and body-building protein of any common food. They are a valuable and versatile soy product for every cook. The sooner we learn to use them the better, for their addition always means increased food value. The soy education program will put the grits in the corner grocery store, and they will be sold under various trade names as well as by the general terms of soy grits and protein enrichers.

Table XVIII.—Soy Grits
Approximate analyses *

	Low fat	Very low fat
Moisture, per cent.....	3 - 5	4
Protein, per cent.....	49 -52	53
Fiber, per cent.....	2.5- 3	2.5
Ash, per cent.....	5 - 5.5	5.5
Fat, per cent.....	6 - 8	1
N.F.E. (nonstarchy) material, per cent	29 -30	34
Calories per 100 g.....	380	357

The product known as soy grits (often called quick-cooking grits) are a different form entirely from the cracked grains known as grits. Soy grits are far more than just plain cracked soybeans. They resemble the low-fat soy flour in taste and food value. The ash content shows them to be exceptionally rich in minerals, and the calcium content is high. They contain such a large proportion of alkaline minerals, including calcium and phosphorus, that the ash is physiologically alkaline. Soy grits can also be considered as a nonstarchy food. Both soy flour and grits are almost entirely free of starch, containing less than 2 per cent. These properties give them profound dietary significance.

The grits are divided into two general classes, the low fat and the very low fat. Their approximate analysis is given in Table XVIII.

The grits are made in sanitary food plants under careful supervision, and the beans are dehulled, de-bittered, and cracked. For one type, the bean meats pass through an expeller that removes part of the oil content. The cake that comes off the expeller is then screened to make a coarse or fine grit, or passed on through a fine milling process to make a low-fat flour. The result is a grit with a milk-sweet, slightly nutty flavor, not too distinctive in itself, that blends easily with many types of food without basically altering the natural flavor of common foods.

The solvent type, or low-fat, grit is produced in a somewhat different manner in that the cracked beans, after being dehulled and de-bittered, are flaked and the fat removed by solvent extraction. After the fat has been extracted, the flakes are either rolled into grits or broken into grit size.

Soy grits cook in 3 to 5 minutes and can be used for cereals, soups, stews, meat-substitute dishes, or to fortify other foods. They are excellent meat enrichers and stretchers and for this reason have been used in the meat industry for many years and are being used in Lend-Lease sausages and other foods (see Chap. IV, page 65).

Soy grits with their high protein content make excellent meat-substitute dishes by themselves and can be made into loaves, patties, vegetarian sausages, and hamburgers, at a cost far below that of the cheapest cuts of meat. When used this way, they need a meatlike seasoning as a finishing touch; and the addition of onion or tomatoes is also appetizing (see Meat-substitute Recipes, page 200).

The grits are also a good addition to vegetable and other soups and may be added when the soup is done. In this way, any soup may be enriched with protein at a moment's notice. Soy grits are also excellent in casserole dishes baked with vegetables; and they can be made into a good hash, with or without meat. The grits can even take the place of cheese, as to food value, in a casserole dish; and they will add one and one-half times as much protein as the equal amount of cheese (see Soy-grit Recipes, page 209).

PUFFED GRITS

It is possible to puff or explode certain types of solvent grits in a manner similar to that used in puffing such grains as wheat or rice. This has been done; the grits are larger and lighter in weight and have a host of practical uses. They can be used like other grits and as croutons in soup, as a ready-to-eat cereal or a protein addition to a cereal, as a topping, or as something to nibble on between meals. The solvent-type grits are often toasted, and they have been sold as a ready-to-eat cereal. Until now, soy grits have been used by the commercial food industries, and the housewife has not been aware of their existence. From now on, she will be able to buy them in the ordinary market under various trade names.

Soy grits are a valuable addition to cereals, and many times they are used as a cereal on a low-starch diet. Many vegetarians also use the grits as a protein breakfast food in place of eggs or the proverbial ham and eggs. The plain cooked grits are not too delightful in flavor, but one can learn to like them; and, if chopped dried fruit or raisins are added or if the grits are cooked in fig or prune juice, the flavor is changed and a desirable natural sweetness is added.

The cook can make her own soy cereals (ready to eat or to cook) by the use of the various soy grits and cracked grains. She can use as little or much soy as she wishes, to suit her family's needs and fancy. The grits may be mixed with cracked wheat, rye, oats, corn, or barley or a mixture of all of them. For the wheat-allergy diet, any mixture may be used minus the wheat (see Cereal Recipes, page 247).

Soy grits are a natural asset in the starch-restricted diet. Dr. Irving D. Ewart, Hollywood, Calif., well-known physician, suggests the mixture of wheat germ and soy grits. The result is a highly nutritious vitamin- and mineral-rich cereal, very low in starch and high in complete protein. The mixture requires only 3 minutes of cooking.

Other advantages of this valuable soy product are its low cost, almost instant cooking time, and excellent keeping qualities. The grits cost but a few cents a pound and go a long way because they swell almost three times their volume. They cook in 3 minutes; this means a great deal when everyone is limited for time. They will keep almost indefinitely in an airtight container.

These features make them extremely valuable for a camper, traveler, or explorer, for he can easily transport several days' supply and with little time or effort prepare a dish equal in food value to meat or any other perishable animal protein.

SOY OIL

Grow more soybeans for victory! This was the government's message to the farmer because soybean oil is needed to win the war. Fats and oils are always precious during wartime. We not only have our war needs to take care of; we must supply the Allies with a billion pounds a year and must replace a billion pounds cut off by war in the Far East.

It is no wonder that soybeans are one of our key war crops and that the government has asked farmers to do their part in meeting the nation's need for fats and oils.

Soybean oil is valuable from both the industrial and the household standpoint. The following list from Purdue University, Vocational Educational Bull. 8, Agricultural Educational Series 6 gives some of its uses:

Household Uses	Industrial Uses
Candy	Antioxidants
Chocolate coatings	Calking compounds
Edible oils	Celluloid
Frying oils	Core binders
Ice cream	Disinfectants
Insecticides	Electrical insulations
Linoleum	Emulsifiers
Lipstick	Enamels
Margarine	Ethyl gasoline
Medicine	Explosives
Mineral oils	Glycerin
Oilcloth	Leather tanning
Rayon	Lubricating greases
Salad oils	Paints
Salves	Printing inks
Shade-cloth coating	Putty
Shoe polish	Rubber substitutes
Soap	Varnishes
Soybean butter	Waterproof goods
Vegetable shortening	Wood preservative

The soy industry had its real start in 1930 with two main products, the oil and meal. The amount of oil and meal obtained from a bushel of beans varies with the variety of the bean and the method of extraction. The commercial varieties of soybeans most commonly grown contain from 18 to 21 per cent of oil. There are two general methods for obtaining the oil: the press, or the expeller type, and the solvent type. Different kinds of presses have different degrees of efficiency; some obtain all but the last 4 per cent of the oil, and others leave a cake that contains $5\frac{1}{2}$ to 6 per cent of oil. The solvent type of mill removes practically all the oil, leaving as a rule less than 1 per cent in the meal. At present, the majority of our mills use the expeller type of oil extraction. Approximately $8\frac{1}{2}$ pounds, or slightly more than 1 gallon of oil, and 45 to 50 pounds of meal are obtained from each bushel of soybeans.

Soybeans at the present time are bearing and will continue to bear the heavy burden in filling the gap in our vegetable-oil supply. They are almost nudging cottonseed oil into second place. The peanut and flax growers are also doing their part, but the total area devoted to those crops is much smaller than that for growing soybeans. As a result of increased acreage, 1,500,000,000 pounds of oil have become available from the 1942 soybean crop.

Today we are using more soy oil as a human food. Its use for table spreads has increased by 70 per cent in the past year, and it is now second only to cottonseed in margarine ingredients. A total of 16,513,181 pounds of soy oil was used in the production of margarine in January, 1943, as compared with 6,905,594 pounds the same month of the year before.

Shortening is one of the major food products of this country. The U.S. Department of Commerce tells us that it now ranks eighth in dollar and cents value among the food industries and that about one and a half billion pounds are manufactured each year in 65 plants scattered over the country.

The U.S. Bureau of the Census gives us the following figures as to the growth of soy oil in shortening: It is only recently that soy oil has been used by the shortening industry and only 8 years ago that manufacturers began to buy the oil freely for this purpose. In 1934, soy oil represented only $\frac{1}{5}$ of 1 per cent of all the fats and oils used for shortening. In 1935, it jumped to 3.4 per cent of the total fats and oils. At that time, the largest shorten-

ing ingredient was cottonseed oil, averaging 70 per cent over the year.

By 1939, the amount had been stepped up to a little over 200,000,000 pounds, or about 15 per cent of all ingredients. The 1942 census report reveals that 335,555,000 pounds of refined soy oil were used that year, or 26.5 per cent of all the vegetable oils and animal fats so used. The Southern cottonseed-oil industry is being challenged by a new rival from the Middle West, and the chances are good that, before the war is over, soy oil will move into first place among various oils and fats used for shortenings.

At present, the War Production Board has restricted soy oil almost entirely to food uses. Fats are valuable wartime foods for both the fighter and the civilian population. With increased demands because of the armed forces, increased demands for war purposes and no foreign supply, plus perhaps decreased production of butter and cream, it is little wonder that we turn to the soybean as a source of edible fat or oil. In 1942, 87.7 per cent of the total "factory consumption" of soy oil went into different food industries.

Edible soy oil is usually a light golden color when deodorized and clarified. The color may vary with the grade of the beans (see Chap. IX, page 163) and is a good substitute for olive oil. It can be used like any vegetable oil for salads, baking, and cooking; but so far its use for this purpose has been limited in the average household. Like the other soy products, it has not reached the grocer's shelf and has been sold only in health-food stores and specialty shops. Here, however, it has many converts who use it externally as well as internally. Some declare its value for softening the skin—it may be used alone or mixed with other oils—while others apply it to the scalp as a hair oil.

MISCELLANEOUS SOY PRODUCTS

There are several other soy products that deserve mentioning. Many of them are not very much in demand as yet, but they do have their value and are different ways of using soybeans as a food.

SOY BUTTER

A raw soy butter may be made from the finely ground beans, usually the soy flour, with soy oil or other vegetable oil beaten into it. The result is a slightly golden butter that can be used

like any nut butter. A roasted soy butter, made from roasted beans that have been ground into fine flour and mixed with oil, makes a butter or spread resembling peanut butter in appearance but different in taste. Roasted soy butter can be made from soy flour that has been carefully browned in the oven, but best results are obtained when the beans are roasted first and then ground into flour. In both cases, the secret of making soy butter is to use the proper amount of oil and to whip or beat the mixture thoroughly. For a crunchy butter, a small amount of ground roasted soybeans may be added.

Soy butter has all the food value of the soybean or soy flour plus the added oil. It may not appeal to everyone, but many prefer it to other nut butters and use it as a common food in their diet. It may be used as spreads, salad dressings, or in place of meat, eggs, fish, or cheese. For sandwich spreads, it may be mixed with minced ripe olives and finely grated vegetables, and for a salad dressing it may be thinned with tomato juice. The addition of a small amount of honey greatly improves the flavor of both the raw and the roasted butter (see Soy Butter Recipes, page 245).

SANDWICH SPREADS

There are several ready-prepared sandwich spreads made with soy cheese, soy grits, and ground soybeans for sale in health-food stores. Many of these are on the same order as the soy loaves and meat-substitute dishes, and they may be mildly seasoned or heavily spiced and smoked to resemble bologna. Although these foods will never be in great demand, they have a definite value to the vegetarian who does not use animal products; and they add variety to the diet at very little cost. Sandwich spreads may also be made at home from the cooked ground soybeans and the cooked soy grits (see Recipes, p. 234).

MALTS

Soy malts, plain or flavored, and various other soy combinations have been popular sellers in health-food stores. Many of them are excellent and equal to highly advertised products to be made with milk for a relaxing nightcap or an invigorating drink. Soy malts and beverages on this order are usually made from the low-fat flour or the powdered soy milk, with added sweetening

and flavoring such as vanilla, chocolate, almond, coconut, and banana. The vanilla and chocolate have proved the most popular flavors. Some of these drinks are also fortified with extra minerals and food elements. They are made instantly with hot milk or water and may also be used as flavorings to custards and desserts. The McBride Soya Products Company of South Pasadena, Calif., a pioneer in various soy foods, have marketed soy malts for several years. Their distribution has been chiefly on the West coast. They also have a soy cocoa. The International Nutrition Laboratory, Mt. Vernon, Ohio, has a soy malt made from its spray-process soy powder.

COFFEE SUBSTITUTES

Heavily roasted and ground soybeans are not a new drink to those who seek coffeelike beverages free from caffeine. Every health-food store stocks several so-called "coffee substitutes" made from soybeans, either all soy or the beans mixed with roasted grains and fruits. Some of these preparations are made instantly with hot water, while others are in the various grinds for percolating, drip, or silex coffee-makers.

Coffee rationing created a tremendous demand for beverages of this kind, and the soybean did its part in that program. Roasted and ground soybeans that were coffeelike in appearance arrived on the grocer's shelf as a victory drink and a coffee stretcher. Their popularity was short-lived, however, and they are back again in the ranks of the regular coffee substitutes.

SOY SAUCE

This ancient seasoning is perhaps the best known of all the soy products because it graces the table of every chop suey house in the nation. Soy sauce is made from the whole beans, and its dark color and flavor are due to the process and the aging. There are several methods of manufacture. One popular method is to steam the beans, grind them, shape them into balls about the size of a grapefruit, and allow them to dry ferment. However, the author has never been able to learn the secret Chinese process between the fermented balls and the barrels of sauce.

Much of the soy sauce used in this country was made by the Japanese. After Pearl Harbor, we had to seek other sources of supply; and some of the sauce put on the market was not only

inferior but "green" because it had not been properly aged. Our use of soy sauce is steadily increasing. Authorities in our Japanese detention camps have become conscious of the great amounts used by these peoples.

Soy sauce may be used for seasoning vegetables, soups, gravies, and sauces, sandwich spreads, salad dressings, as well as rice and other carbohydrate foods. It is salty to the taste, and allowance for the salt content must be made when it is used in cooking (see Gravies and Sauces, page 225).

Soy Albumen

Soy albumen is one of the newer products of the soybean and is made to replace egg albumen in candy manufacture. There are limitations, however, to its use. Soy albumen, for instance, will not make meringue but will make marshmallow. Soy albumen will beat up lighter than egg albumen and will not overbeat even if it is left in the beater a half hour overtime. It will not stand up as long as egg albumen after whipping. Soy albumen has been on the market for commercial purposes for some time. During the past two years it has been greatly improved and is now successfully replacing egg albumen in many instances. Other uses for it will no doubt be discovered.

The soybean may have had a hard time securing a toehold in the American diet, but there is no question now of its being here and here to stay. Its "soup to nuts" quality has allowed it to invade everything edible from coffee to candy and has placed it well on the road to national popularity. From now on, we can expect new soy products, new merchandising, and extensive advertising that will establish the little round bean in every corner grocery store.

Chapter VI

The Blazed Trail

EVERY successful movement, idea, and invention has back of it a pioneer or a few pioneers who saw possibilities when the rest of the world scoffed. Slavery was stamped out and women were given the right to vote in this country because a few pioneers were willing to work against odds for these movements. The airplane, the radio, the automobile, the telephone, and all the wonders of the modern world were made possible through the work of a pioneer. It is the rule of progress, and fortunate is the pioneer who can live to see the fulfillment of his dream! The soybean has not been an exception to this rule; and the rise of the soy industry in the United States is due to the work of its pioneers. They are the ones who have made its nutritional acceptance possible and have paved the way for its role as a vital emergency food today.

OUR TARDY ACCEPTANCE

Until recently, America was not interested in soybeans as a food. Their nutritional merits did not impress us, and we paid little if any attention to the food that helped to shape the destiny of the Orient.

Our acceptance of soybeans has been very slow for several reasons. First perhaps is the fact that they are not a native of our land. We have not been brought up with them, or on them; we are not acquainted with them, and most of us have no idea

how to use them. Second, and this goes hand in hand with the first, we as a nation have not needed soybeans as a food. We have had a bountiful supply of other protein foods—meat, milk, and eggs—and have had no reason to turn to soybeans as a substitute for these foods. This has not been true of China or Japan or the rest of the Orient, where soybeans have been the poor man's meat and his milk, bread, cheese, and oil as well. The third reason is the bean itself. The wonder food of the Far East is not only insignificant in appearance but is flat and lacking in flavor. It has needed to be dressed up for the American table. The necessity brought on by the war has done just that.

As yet the soybean is a new food for the Western world. So far the American housewife has not been able to find it, and, even if she did, there was nothing to intrigue her into trying it. Soybeans and soy products have gradually crept onto the American market where they have proved increasingly popular, but until recently their sale has been limited. Now that big business has entered the picture, however, all will be changed, and the housewife will be exposed not only to the soybean but to all its products.

One fact we must not forget is that Americans are prejudiced against new foods and cling to their favorite dishes. The average man is perfectly content with "what mother used to cook" and does not want to be jogged out of his gastronomical rut. Up to now he has dismissed the soybean with a shrug of his shoulders and has not been willing to give it half a chance. He probably would never taste a bean unless his wife slipped it to him without his knowledge or his doctor ordered soybeans or soy bread in his diet.

We must also remember that popular and palatable soy products are the result of recent research. Often the early soy concoctions were not designed to satisfy psychological hunger, and they had little appeal for the average person who was not already convinced of the merits of the bean or whose diet did not call for soy products. Today food manufacturers know how to de-bitter the beans for flour and know how to make tasty soy products of all kinds (see page 113).

One great handicap, and it is one that has developed naturally, is the fact that until recently soybeans have been classed as a diet food and a so-called "health food." The average individual has considered them a food for Aunt Minnie and her diabetes and not

a food for a healthy mortal. The low starch content and alkaline ash of soybeans as well as their nutritional qualities have naturally made them a food for specific diets, and it is no wonder that they have automatically fallen into the category of a health food.

If there is any term that is misplaced and abused in the English language today, it is "health food." To an astonishing number of persons, those two words appear to mean something in a bottle, something to make them well, something to be avoided until absolute necessity brings it to their attention. As a matter of fact, our real health foods are our God-given, natural, common-sense foods that supply the body with what Nature intended it to have. It is we who often lack the common sense and the will power to use them.

FOOD PIONEERS

Until a few months ago, soybeans were not news, and the general public had to be educated to them. This required both time and patience. Naturally, the turnover on such products was too slow for the average grocery store. The beans, consequently, had to find an outlet through channels in which their nutritional value was understood, where there was a demand for them, and where someone would be willing and could afford to spend money, time, and sales effort in selling them. Up to the present, the health-food stores have been about the only champions of the little bean and the only ones willing to devote the necessary effort to the sale of soy products. Soy products have not sold themselves. Their popularity today is due in large measure to the health-food industry. These pioneers of a better nutritional program have fought for years in spite of ridicule for unrefined foods, brown rice, whole-grain cereals and flours and have battled their way into the business world.

The health-food industry is still small, but it has left its mark on the American public and on American business. Today, both drug and grocery stores are trying to absorb the business of the little health-food store. Health-food stores (they should be called natural-food stores) carry foods for the special and corrective diet. Since soybeans and their many products have a natural place in such diets, they therefore have a natural place in the health-food store. The beans, because of their low starch content, have been perfect for the starch-restricted diet and as

diabetic foods and the like; and for several years there have been any number of diabetic products containing soy on the market. Soy bread was first put out for the special diet, one of its early advocates being Dr. W. D. Sansum of Santa Barbara, Calif., a now famous pioneer in the dietary field. Another advantage of the bean is its alkaline ash; and for this reason it is often suggested in place of meat, fish, or eggs. The high mineral and vitamin B content of the various soy products places them in a protective class of foods, with whole grains and other vitamin- and mineral-rich foods. Soy milk and soy cheese are often given on special diets (see Chap. VII, page 127).

Because of their physical make-up, soybeans will always be a valuable special dietary food. Recent allergy studies have opened up a vast new field in this respect, because they have shown that the beans can be used in place of wheat, milk, or eggs, the three most frequently offending allergy foods (see Chap. VII, page 125). Soybeans are certain to become a common food in the American diet, but their value will not decrease in the special dietary field. In fact, soy is going to become more popular than ever as a diet food, because the medical profession is turning more and more to nutrition as a factor in illness. All indications are that the bean will have a hard time to outgrow the term "health food," but the term "health" will have an enlarged meaning.

Vegetarians have played an important part in making soybeans an American food. Because the beans are the best meat substitute from the vegetable kingdom, they will always be used to a great extent by the vegetarian in place of meat. Many strict vegetarians will not use animal products in any form; and for these the beans serve as milk, eggs, and cheese as well. Religious groups, such as the Seventh-day Adventists who eat no meat, have found a food of practically equal protein value in soybeans and have done more perhaps to place them on the retail shelf than anyone else. Their products at first were often not scientifically perfect, yet these groups were the pioneers who proved there was a market for soybeans and soy products in the United States.

There are several large and small Seventh-day Adventist food concerns in this country that manufacture a complete supply of soy products, most of which are cooked and ready to use.

As pioneers, all these Adventist concerns have done considerable research on soybeans, and most of them employ chemists who have had firsthand experience with the beans in China. These men know the food value of the bean, what it has meant nutritionally elsewhere, and they have strived to perfect formulas for well-balanced and complete vegetable protein foods to take the place of meat. Most of these concerns also manufacture soy milk, fortified to equal dairy milk in food value. Their meatlike products at first were for the use of their own people, their hospitals, and institutions; but demands for vegetable protein have brought them into health-food stores and food specialty shops. Sales on these products have been steadily increasing with a rapid rise in the last 3 years, climaxed by meat and cheese rationing. The sale will continue after the present crisis, because the public will have developed a taste for them and a recognition of their food values. The cost, too, is usually below that of meat and fish. If meat substitutes could force their way into the American food world before the war, they are certainly going to stay there after the war.

Perhaps the best known of the pioneer institutions is Madison College, Tennessee. It is doing an outstanding job in maintaining a self-supporting college and a sanitarium and in developing a complete line of soy products that are being sold on an international scale. Madison's curriculum includes 27 campus industries run by the students to support the college and themselves. A 900-acre college farm is operated entirely by student labor and is also self-supporting. The student canning factory was started when the college was in its infancy, almost forty years ago; and several years of research in food chemistry have resulted in many new products built around the soybean. Madison College is largely responsible for making soybeans appetizing. They have developed a soy milk that has received world recognition; and observers have come from Africa, India, and other countries where milch cows are scarce, to study the methods of Madison's soybean dairy. They also make soy cheese and several meat substitutes, as well as a soybean beverage. These foods are now well distributed over the United States and some foreign countries, including South Africa.

The Loma Linda Food Company of California was originally established to supply nutritious vegetarian foods to institutions

and hospitals, but it soon outgrew that field. Its sales in the last 3 years have grown by leaps and bounds. The first 6 months of 1943 almost doubled 1942; and today the company has national distribution of a complete group of soy products including canned beans, soy milk, cheese, several meat substitutes, a soy coffeelike beverage, and soy-fortified cereals.

The International Nutrition Laboratory under the direction of Dr. H. W. Miller has featured several soy products, among them a spray-process powdered milk that is fortified to equal dairy milk in food value. Dr. Miller is a well-known authority on soybeans, having had firsthand experience with them in China. There are many other concerns on this order in the United States, and all have made the consumer conscious of soybeans and their value in the diet and have proved that there is a demand for them.

Special dietary concerns have also been soy merchandising pioneers. They have used quantities of soybeans and soy flour in their products, because this almost starchless food is excellent for diabetic and starch-restricted diets. There are now several concerns making these foods, and nearly all have national distribution for their products.

ESTABLISHING SOYBEANS IN THE KITCHEN

Up to the present, there has not been any definite or connected educational program on the use of the beans as a food. It has been more or less of a hit-and-miss proposition, the housewife getting a recipe if she could or making up one of her own. Soy was used because it was soy, with little thought given to palatability or appearance. Independent concerns manufacturing dietary or regular soy products published recipes if they could afford to do so, but these did not reach the average household. Health publications featured soy, but again their sale or distribution was limited. The Edison Institute published a booklet containing some fifty different ways to use the beans, as did a few others interested in them as food, but distribution of these booklets was not far-reaching.

Pioneer work on soybean recipes has been carried on for several years by the U.S. Department of Agriculture, the U.S. Bureau of Home Economics, and the home economics departments of various universities; and to them the industry owes a vote of gratitude. Bulletins containing soy recipes can be secured from

all these sources; and intensive research work is being done at the present time. The Bureau of Human Nutrition and Home Economics, U.S. Department of Agriculture, has issued a booklet "Cooking with Soya Flour and Grits" that will help to place these valuable food products in our diet. Additional information can be obtained from *Miscellaneous Publication 534*, "Soybeans and Soybean Products as Food," issued by the U.S. Department of Agriculture. For teachers, demonstrations, and exhibits, the Department of Agriculture has prepared four charts, 14½ by 20 inches, entitled, "Get Acquainted with Soya Flour and Grits." These can be secured from the Superintendent of Documents, Washington, D.C., for a small sum.

The Agricultural Marketing Administration is responsible for the making of satisfying soups containing soybeans, both for the American Red Cross abroad and for school lunches at home. At present, they are working with the U.S. Bureau of Home Economics in finding ways for the homemakers to use soy products in the form of protein-rich dishes. "School Lunch Recipes," *Miscellaneous Publication 537*, U.S. Department of Agriculture, gives information on soy in school lunches.

The railroads of the soybean states have perhaps done more to further the industry than any other group; and they have sponsored huge educational projects to improve the quality and quantity of the soybeans and to further their use.

As early as 1926, soy-processing mills needed increased acreage to enable them to operate throughout most of the year. They asked the cooperation of the railroads in interesting the farmers in growing beans, and as a result various soy trains and soy exhibits toured the states of the corn belt.

In 1926, the Illinois Central in conjunction with the crops department of the University of Illinois organized a three-car train of soy exhibits and two picture cars, in which moving pictures were shown to demonstrate the then recognized practices for growing the crop. This train made some ninety stops in Illinois and was visited by thousands of farmers. The project helped to stimulate an increased acreage of 44,000 the following year. Later, the program was carried out in Iowa with excellent response.

Another such project was the Pennsylvania Railroad Soybean Exhibit Car, prepared in cooperation with the American Soybean

Association, the U.S. Department of Agriculture, and the state agriculture colleges in the 18 states through which it operated, for the purpose of acquainting industry, agriculture, and consumers with the importance and possibilities of the soybean in our national life.

The years 1934 and 1936 were drought years, and hay crops were particularly short. The soybean, because of its drought resistance, supplied the demand for hay. The 1937 season proved to be good for forage crops; and, since the soybean was not needed for hay, there was a tremendous increase in the amount of beans harvested for grain. This in turn presented a need for outlets throughout industry. The consumer was not conscious of the many products made from soybeans; and the purpose of the exhibit car was to aid processors in establishing markets for these products. The car glistened inside and out with soybean-oil paint and varnish, and the interior was finished with plywood in which soybean glue is a necessary factor. Attractively colored transparent pictures told the story of the soybean from the preparation of the seedbed to its ultimate use. These pictures also told the story of the crude Oriental practices in processing compared with our modern mills. Exhibits of food, feed, and industrial products totaling 150 different uses were displayed. The work of the U.S. Regional Soybean Industrial Products Laboratory was shown, that the public might become better acquainted with the Department of Agriculture's search for new uses of farm crops. Interesting meetings were held on the train at which the products and utilization of soybeans were explained by college and industrial experts. One section of the exhibit car was devoted to the food uses of the bean.

Russel G. East, general agricultural agent of the Pennsylvania Railroad, gave the following report on the car's itinerary:

Probably no exhibit with a rural background has reached and held the interest of so many urban people. A large supply of literature, including annual reports of the American Soybean Association, bulletins from state experiment stations, United States Department of Agriculture publications, miscellaneous educational material prepared by local interests, and recipes for the soybean and its products were distributed extensively.

This traveling exhibit covered 17,643 miles in 18 states and was visited by 198,286 interested people.

The Soybean Exhibit Car started its tour at New Brunswick, New Jersey, August 16, 1937. Dr. J. G. Lipman, Dean of the College of Agriculture, very appropriately dedicated the exhibit to the service of the soybean industry in honor of Mr. James Neilson, who was for 50 years a trustee of Rutgers University and grew the first commercial crop of soybeans in America on what is now the New Jersey Experiment Station grounds. Inspection of the soybean experimental plots in the field where the crop was first grown by Mr. Neilson in 1878 was a feature of the dedication ceremonies.

The nation's Capitol was the next objective of the exhibit car, after which it began a tour including New Jersey, Delaware, Maryland, Pennsylvania, Ohio, Indiana, and Illinois.

Arrangements were made by the University of Illinois Agronomy Department to place the display on the university campus for the occasion of the annual meeting of the American Soybean Association. This was the climax of the exhibit car's first scheduled tour, traveling from the place where soybeans were first grown commercially and concluding its schedule in the greatest soybean production center on the American continent.

In its travels this display proved so popular that it was found necessary to extend the operation into other sections. The new itinerary included visits to fairs, expositions, soybean processing plants, and industries using the soybean in their production program.

Three railroads availed themselves of the opportunity to take this exhibit into their territories. This broadened the scope of the exhibit until it reached from South Dakota on the West to Florida in the South. The interest manifested shows the wide field to which the soybean has become adapted.

The Minneapolis and St. Louis Railroad, through their industrial and agricultural department, handled the display over their lines through Illinois, Iowa, Minnesota, and South Dakota. So great was the interest, their original schedule had to be increased to take care of the insistent demands of the people in those states.

The agricultural department of the Seaboard Air Line Railway arranged a schedule covering the South Atlantic states. In Florida the Tampa and Orlando Fairs included the display among their agricultural exhibits. Unusual interest was noted in Georgia and the Carolinas. Soybeans were found to be increasing in these states and in eastern Virginia. More than 32,000 people visited the exhibit while on the Seaboard Railway.

A final tour was made through the dairy and poultry districts of the East, particularly emphasizing the place of the soybean in feed rations. The largest attendance, outside of fairs and expositions, was found on

this trip. Included in this was the time spent on the Coudersport and Port Alleghany Railroad.

The exhibit car was dismantled after the tour and was replaced by two portable exhibits that have been visited by some 3,000,000 people. During recent months, owing to the burden of wartime transportation, these exhibits have been kept off the road.



FIG. 6.—Interior of soybean exhibit car, Pennsylvania Railroad.

Another railroad educational project was the Baltimore & Ohio "Soybean Special" of 1941. This was made possible through the cooperation of the Agricultural Extension service and Agricultural Experiment Station of the University of Illinois, American Soybean Association, National Soybean Processor Association, Baltimore & Ohio Railroad and Alton Railroad and spent 6 weeks on tour throughout the soybean-producing territories of Ohio, Indiana, and Illinois. The train consisted of six coaches, three devoted entirely to soybeans, and the other three for living accommodations for the staff of 20 persons. The three exhibit cars consisted of a general soy exhibit car that covered the field of production and utilization; a farmer lecture car, a program of

motion pictures and lectures on soybean varieties, production, and marketing; and a woman's lecture and exhibit car in which a cooking school was conducted and meatless soy loaf, soy date muffins, and soy fudge were served, supplemented by an exhibit of more than 200 food products made from soybeans.

Two brochures, "Soybean Recipes" and "The Magic Plant," prepared by the Agricultural Development Department of the railroad were distributed from the "Special."

These proved so popular that several reprints have been made, and distribution still continues with requests coming from practically every state and several foreign countries. The railroad regards it as one of the most successful agricultural and educational projects they have ever conducted.

Henry Ford's name will always be linked with pioneering work with the soybean, and he has done much to promote their use nutritionally as well as industrially. He has been greatly interested in them as a food and has encouraged his workers to use them. The Edison Institute published a book of soy recipes for bread, biscuits, cakes, cookies, salads, meat substitutes, milk, cheese, and butter; and anyone visiting Greenfield Village comes away with a knowledge of soy flour, soy grits, and other soy products.

The popularity and possibility of utilizing beans on a national scale have come about through the extensive research work of the soybean processors. They have been responsible for the hundred and one soy fortified foods of today and have given us edible soy oil, soy flour, soy grits, and even soy lecithin; but seldom have their products reached the consumer directly. We have used them as shortening, margarine, mayonnaise, sausage, bread, macaroni, and even candy, often without knowledge of their presence. These concerns have been the ones to perfect soybeans for the butcher, the baker, the candlestick maker. They have been the power behind the scenes in soybeans for human consumption.

It is easy to say "add a little soy" or "manufacture soy products," but it is another problem to make them acceptable to the public. If a product is to be good, it must satisfy psychological as well as physiological hunger. We must be well fed and at the same time enjoy our food and have a feeling of satisfaction and fullness. Many of the early soy products were all right phy-

siologically but very much minus psychologically; and it is no wonder their reception was lukewarm.

Today we have an entirely different picture. Food manufacturers now know how to make palatable soy products; they have made a scientific study of the bean and how it can and should be used. They have learned the secret of de-bittering, dehulling and, in some cases, degerminating, as well as temperature control, destroying or retaining enzymes, checking fermentation, and making use of the absorption properties. Once these basic facts were established, the soy-food manufacturers were able to turn out good soy products. Their progress has not been spectacular; but it has been steady and consistent, until, in the terms of A. A. Levinson of the Soy Products Division, Glidden Company, the soy industry is ready to say, "Show us the food, and if soy should be used in it, we will show you the proper soy product to be used in its manufacture and the proper way to use it."

Quality is established only in the course of time. Unfortunately, rigid specifications have not been applied to the various soy products as they should have been. This has been one of the major purposes of the Soy Flour Association. Recent army specifications have driven home the value of quality-controlled products, and Col. Rohland A. Isker believes that rigid specifications are a decided advantage to the whole industry.

So often when we think of a pioneer, we picture a courageous individual on horseback, riding into the wilderness and establishing new frontiers for his country. There have been many pioneers at home behind the plow, the kitchen stove, the workbench, and the test tube who, unheralded, have conquered frontiers for American agriculture, industry, commerce, and nutrition. The little food manufacturer has been a true pioneer in his work on soybeans. Often its nutritional value was his only inspiration because the product lacked both taste and eye appeal and was entirely unknown and unwanted by the average American. In his experiments as a pioneer, often he did not know how to use the bean and literally stumbled along in its manufacture. It is no wonder that his first products were often unscientifically prepared and lacked uniformity as well as palatable qualities. In spite of ridicule, hard work, sales resistance, and little demand, the soy manufacturer has blazed new trails and gradually conquered new territories. The background of

every successful soy manufacturer proves this fact as does that of every other industry. The sewing machine, the automobile, the radio, and the airplane were not developed and perfected in a day. Each step of progress led to something bigger and better, and today's successes are built upon the struggles of the pioneers of the past.

The soybean is now on the threshold of a new nutritional era in the United States, and no single group or person has been responsible for establishing them in the American diet. Again it has been the work of the pioneer, the men of business and industry, the chemist, the doctor, the dietitian, even the housewife; and without their work our Oriental immigrant would not be ready to play its vital role in world nutrition.

Chapter VII

The Challenge of Nutrition

THE American grocery bill amounts to some 12 billion dollars yearly. This vast amount of food is purchased with very little fundamental knowledge of the composition of foods and individual requirements. We have been more concerned with palate-tickling qualities than with nutritive contents. Then, too, our tastes have been diverted from simple foods to elaborate concoctions, and our staple groceries have been robbed of their most essential elements to fit a streamlined and commercial age.

THE DANGERS OF HIDDEN HUNGERS

A recent survey shows that only one-half of the adult population has learned that there is a close connection between diet and health. We pride ourselves on being the best fed nation in the world and yet allow "hidden hungers" to menace our physical fitness. Because of lack of nutritional knowledge, thousands have been threatened with starvation in the midst of plenty.

A lack of money is not always the reason for a poor selection of food, for surveys show also that folk who have money for better food do not necessarily spend it for foods that build resistance to disease. Former Vice-president Henry Wallace in *Food and Life*, says:

Fifty per cent of the people in the United States do not get enough in the way of protective foods to enable them to enjoy full vigor and health.

Lack of common-sense knowledge of nutrition even among the well-to-do people in the United States, is appalling. There are many kinds of "hidden hungers" that the experienced person can read in the faces and attitudes of the undernourished.

Although it is true that many of us do not know how to select the more nutritious foods, it is likewise true that the vast majority of us are guided by our habits or tastes rather than by common sense or by the rules of better nutrition. Somehow we prefer the tempting delicacies that look and taste so good but are lacking in the true protective elements. As a nation, we have used far too much sugar and starch. For proof, we can remember the huge candy and cookie counters of our prewar ten-cent stores. There were bins and bins of cheap highly colored sweets, chocolates, gumdrops, and heavily frosted cookies, plus "airy" candy bars to give the impression of a "lot for a nickel." That counter was usually the busiest in the store, surrounded by throngs of children eagerly waiting to spend their pennies. Here is one case in which war shortages and rationing have proved a blessing.

A half hour spent in a fountain lunch in the average drugstore is enlightening as to what America is eating: the usual cup of coffee and doughnut for breakfast; the piece of pie and a soft drink for lunch; these are examples of what is enjoyed daily by any number of intelligent persons all over the land. Meals like this day after day, month after month, perhaps even year after year, are certain to tell their tale. It is little wonder that Dr. M. L. Wilson, U.S. War Food Administration, recently estimated that 45 million people in the United States are not getting proper foods and are, as a consequence, undernourished.

Dr. Barnett Sure of Arkansas University declares:

Six million children are malnourished. It is conservative to estimate that 30 per cent of the population of this country are the victims of malnutrition and that the "little things in life," vitamins and minerals, are after all "the biggest things in life."

Unfortunately it is impossible to tell by looking at, tasting, or smelling foods if they are rich in the essential elements. What we must have is a fundamental knowledge of nutrition and the needs of the human body, plus the application of that knowledge, if we are to have a nation of healthy citizens for the world of tomorrow.

NUTRITION AND HEALTH

Today food is a basic weapon, nutrition is a fighting word, and illness is sabotage on the home front. Health and vitality have become what they long should have been—a national affair. Never before has there been such a need for physical fitness. Never before have we had the scientific knowledge of nutrition that, if applied, can mean a longer and happier life for the individual. We have become aware that there is a close connection between diet or nutrition and health. We know that we cannot build sturdy bodies without proper material. And that material is food. We know that health and vitality can be built through *planned* nutrition!

Any poultry, sheep, cattle, or mink farmer knows that a deficient diet means the ruin of his herd or flock; and that in turn means financial ruin to him. Extensive animal-diet research has been carried on for many years; and the farmer knows that, if his animals receive foods that supply *all* their bodily requirements, health is the result. If, on the other hand, their food is lacking in only one vitamin or one mineral, or if it has too few calories, the animals will not be healthy and disease will be the result. Our animals are fed for top-notch physical condition. *Somehow intelligent America has not applied these same laws to the human body.* It can truly be said that our poultry, cattle, and even pets have been better fed than the average American. As a nation, we must devote as much thought to our own diet as we do to that of our animals.

Dr. Russell M. Wildner of the Mayo Foundation, Rochester, Minn., said at the National Nutrition Conference held in Washington, D.C., in May, 1941:

The scientists who, for twenty years or more, have studied nutrition in animals have indulged quite frequently in caustic comment on the failure of the medical profession to come to grips with malnutrition.

Today medical science has developed a keen nutrition consciousness and, according to Henry C. Sherman, professor of nutrition, Columbia University, is finding in nutrition the solution for many of its most baffling problems.

The knowledge and application of the new nutrition promise, in the words of Dr. James S. McLester, Director of Medicine, Alabama University:

. . . a larger stature, greater vigor, increased longevity and a higher level of cultural attainment. To a measurable degree, man is now master of his own destiny where once he was subject only to the grim hand of fate.

The effect of proper nutrition is readily seen in human stature. Raising the standard of living has brought about a steady increase of stature in the peoples of the Western world. Our soldiers today are taller and broader than those of 50 years ago and even those of the First World War. Miss America of today is several inches taller than Miss Colonial. The soybean-eating Chinese of the north are larger than the rice-eating population of South China. Soldiers under military rule and rations are usually taller and larger than civilians. Wars and famines leave their effect not only on the vitality of the people but on their stature. German fourteen-year-old children of the First World War were shorter than their normal height, owing to the lack of proper foods. The average height of Norwegian fourteen-year-old children was increased 4 inches by proper foods. Most of the children of war-torn nations will be stunted in growth after this world conflict. The greater the food shortage, the more stunted the growth of the children.

Planned nutrition means all that Dr. McLester says it does and perhaps even more. Better nutrition makes better citizens. A properly nourished individual is more social, more peaceful, more cooperative and ambitious, and more successful. Dr. Pierre A. Boncquet, Los Angeles, Calif., cites an experiment on 130 so-called "problem boys." A survey of their diets revealed nutritional deficiencies, and these were immediately rectified. After a few weeks, the boys were properly nourished individuals. They were no longer problem boys but instead were happy, cooperative young citizens.

Conditions like this are perhaps best illustrated by the story of the runt animal. We are familiar with the little runt pig or puppy that cannot hold his own with the rest of the litter in his fight for nourishment. He is small, underweight, quarrelsome, squealing for food, and has not half the chance of his brothers and sisters. A runt animal is usually suffering from malnutrition; and if this is the only reason for his deformity it can easily be rectified with proper food. Feed the runt, give him a nutritional chance, and he becomes a friendly, healthy, normal animal. So

with the problem child. Malnutrition may make him behave like a runt animal; but, when he is properly nourished, he will become a happy cooperative individual with often greatly improved mental ability. Someday we may perhaps even consider malnutrition one of the factors in the prevention of crime.

Surgeon General Thomas Parran, U.S. Public Health Service, said at the National Nutrition Conference for Defense that food will build a new America, a stronger, more intelligent, more competent race. He declared, too, "Tomorrow's civilization can be made vastly different, and far better than today's, if we put to work now, what we know now, about the nutrition of human beings."

Dr. Alexis Carrel, in *Man the Unknown*, points out that man is literally made from the dust of the earth. His physiological and mental activities are profoundly influenced by the geographical constitution of the country where he lives and by the nature of the animals and plants on which he feeds. Dr. Carrel says too that man's structure and functions depend on his selection of foods. The chiefs of a tribe always had a diet vastly different from that of their slaves. The warriors who fought and commanded had chiefly meat and fermented drinks, while the peaceful and submissive were satisfied with milk, vegetables, fruits, and cereals. Many a vegetarian preaches this same doctrine today.

Proper diet, or better nutrition, is the key to radiant health and glowing vitality. It is the sensible way of giving Nature a chance to prove what she can do. We must, however, give this body of ours what it was intended to have. That is what we have not done. Not only have we, as a rule, eaten far too much food for the amount of exercise we take, but we have robbed ourselves of the unseen vitamins and minerals that are absolutely essential to health. We have used too many refined and highly processed foods, lacking in the protective elements; and it is no wonder that nutritional deficiencies have developed. It is no wonder that our teeth are soft from the lack of calcium, and our nerves irritated and jittery from the lack of vitamin B.

The progress of civilization has not brought with it greater physical fitness; in fact, it has done just the opposite. Dr. Weston A. Price, member of the Research Commission of the American Dental Association and fellow of the American Anthro-

pologists, in comparing primitive and modern diets, gives ample proof that modern nutrition has led to physical degeneration. He shows that racial stocks living on a simple diet of whole grains, dairy products, seafoods, organs and blood of animals, fruits, and vegetables had but one tooth with a cavity in every thousand teeth examined. Dr. Weston compares this with the same type of people living on a modernized diet who have approximately 200 to 500 teeth per thousand with cavities. Brigadier General H. B. Hershey of the Selective Service reported that one-third of the first million men examined for the Second World War were rejected because of ailments traceable to nutritional deficiencies.

We cannot say that these deficiencies are all due to refining our foods and making them a commercial success. They are rather the net result of our modern living. The depletion of our soils, the artificial feeding and unnatural living of our cows and chickens, our disregard for localities and seasons, the housewife's insistence on almost instantly prepared foods, all play a part in robbing our foods of minute and unseen factors that have a bearing on health and vitality.

Nature supplied everything that man needs for physical fitness in his food. Naturally, as we take away certain elements, that food becomes lacking. *Common sense tells us that we must replace that which has been taken away.* What have we done? We have turned to the synthetic vitamin, the pill, the tablet, instead of to our natural, unrefined foods. We have taken the easy way, the way that does not require any change of eating habits or exertion of the will.

Science will never be able to duplicate nature. Synthetic vitamins and minerals will never equal the intricate combinations of natural foods. Pills and capsules can never replace a normal diet. As a result, we must go back to the use of more natural, unrefined foods with their known and unknown vitamins. We must replenish our soils and strive to produce foods that contain what Nature intended them to contain. We must apply the wealth of nutritional knowledge that we have today and make it common-sense living.

The great tragedy is that usually we do not pay any attention to diet or to the laws of nutrition until late in life. Only as we become ill, or as we grow older and feel the hand of Time upon

our shoulder, do we begin to realize that what we eat and how we live have a bearing on how we feel. Think what the knowledge of nutrition can mean to the youth of America. From the standpoint of health, better nutrition means smaller outlay for illness, less loss of working time, greater physical and mental efficiency, and a longer and more productive life. Our knowledge and application of these nutritional laws is our best insurance for better health. Making this knowledge general is the nutritional challenge in the world of tomorrow. It is our job, yours and mine, and we cannot teach efficiently unless we practice what we preach.

And where does the soybean enter this nutritional picture? Not as a magic food by any means; it is merely a bean with extraordinary food values. Soybeans as food supply the body with a complete form of protein and are also an excellent source of vitamins and minerals. Soybeans in the form of soy flour are an enriching food, a supplement to increase nourishment and a plus element wherever they are added. Soybeans have proved their worth in the special and corrective diet, and that same nutritional value can be carried over to our everyday diets.

CORRECTIVE NUTRITION

Two thousand years ago, Hippocrates said, "Let food be your medicine." This is an eternal truth, actually unrecognized in this country, startling as the fact may seem. The trouble is that we have not regarded food as our medicine. Instead, we have destroyed essential nutritive elements and then have tried drugs and even surgery as a means of overcoming deficiencies developed from our artificial foods. Natural protective foods are our best medicine and, when combined with sensible living, become a prescription for better health. They are the corrective regime that brings lasting results.

Diet today is the key word in the healing art. *A proper corrective diet is only the means of cooperating with the natural powers of the body.* Many times it has accomplished wonders in spite of the verdict, "Nothing can be done." Science will never be able to fathom the limit or the power of nature and the recuperative powers of the human body.

The so-called "diet movement" is not new. It is old, and many a pioneer in the field has faced ridicule or condemnation

because of his beliefs. The world is quick to ridicule and to condemn the new, even in spite of proof. Our newer knowledge of the science of nutrition has brought back the words of some of the pioneers, the men who were scoffed at when they talked of natural elements, now known as vitamins and minerals. We are scoffing today at men who stress the value of grains and vegetables raised on mineralized soil, of milk from green-grass-fed cows, of fertile eggs, of sprouted foods, and of what seemingly unimportant factors in food can mean to human vitality.

In the days of the Civil War, Sylvester Graham fought for whole-wheat flour, and as a result Graham flour bears his name. Since then men of all walks of life who have advocated physical culture, unrefined foods, and corrective diets have been criticized because they have had the courage to teach what today we recognize as a fundamental truth.

So it is with the diet field. It has taken on new importance in the last few years and in many cases has gone from one extreme to the other. A new movement is often ushered in by fanatics. Often something fanatical and extreme seems necessary to make us realize the nucleus of good. This certainly has been true of the dietary field. Out of all the extremes has come a great awakening to what food—proper food—and corrective nutrition can do for the human body. We cannot, however, claim that nutrition is a cure-all; neither should we place a blanket condemnation on diets that may seem too rigid or too extreme; in some cases they have meant a complete rejuvenation of the body and restored health when science admitted defeat.

It is no wonder that the soybean, with all its nutritional merits, entered the diet field and soon pushed or was pushed to the top rank as a wonder food, as a miracle bean, even almost as a solution to all ills. Its chemical composition of about 40 per cent of highly digestible protein, heavily reinforced with approximately 20 per cent of fat, practically minus starch, with essential vitamins, minerals, and lecithin, plus an alkaline reaction makes it a natural asset in the corrective- and special-diet field.

STARCH-RESTRICTED DIETS

The soybean, being low in carbohydrates and almost starch-free, is highly desirable for the low-starch diet. For this reason, soybeans in various forms have long been used by the diabetic.

In fact, soy has been earmarked as a diabetic food in the minds of the general public. It is interesting to note that soy-wheat bread with a content of 25 to 30 per cent soy flour is gaining in popularity over gluten bread, the long-established bread for the diabetic. Soy-gluten bread made of soy, gluten, and wheat flours is perhaps even more popular with these patients. Soy bread, nutritionally, has more in its favor than gluten bread. Soy protein is of better quality and more nutritious than gluten or the protein of wheat. This type of bread has a higher mineral and vitamin content as well.

Breads of this kind are as yet limited items, usually made only by small bakers or by those catering to special diet needs. In the future, we shall no doubt see an increased demand for dietary breads and special foods of all kinds. The corrective diet, the allergy diet, and other special diets are here to stay; and some progressive baker is going to cater to the needs of those who use them.

The low carbohydrate content of soy has automatically placed it in the diet of the obese, or overweight (see *Reducing Diets*, page 129). The trend to limit the starches and sugars in special diets today opens a fertile field for soy flour and other soy products.

MEATLESS DIETS

The protein content of the soybean has recently been recognized and has become another reason for popularity. Man has proved that health can be maintained without meat and other animal products, but it cannot be maintained without the essential amino acids found in animal products. Most vegetable proteins do not contain all the essential amino acids. Unless he varies his diet greatly so as to secure all sources of vegetable protein, a person who does not eat meat, milk, fish, or eggs is likely, after a period of time, to show signs of protein deficiency. It does not make any difference to the body if the protein is from a vegetable or an animal source. It is securing the essential amino acids that counts. The soybean with its protein is therefore one of the most valuable foods in the vegetarian diet. In days of meat rationing, this is important for meat eaters and vegetarians alike.

Nature provides a wonderful combination in the soybean of highly nutritious protein and an alkaline ash. Many consider that this fact alone is the bean's greatest asset. Increased alkaline ash aids in building resistance to disease and infection and in relieving acidosis. Many doctors suggest soybeans in place of meat or eggs, knowing that the patient will receive sufficient protein minus putrefaction and acid ash. Dr. Harry W. Miller, of the International Nutritional Laboratory, Mount Vernon, Ohio, is a great advocate of this type of protein food and says it is secured in pure form free from the products of putrefaction that are found in animal protein. He says that it may be classed as a pure unadulterated food, uncontaminated by waste material or disease. The alkaline-ash factor has often been one of the major reasons for soy- and lima-bean breads in the special diet.

ALLERGY DIETS

A few years ago, allergy was an unknown term. Today it is a popular term, almost a stylish term; and it is a recognized fact that we may have an allergy to or an intolerance for practically every kind of food and everything from dust to goose feathers. Allergy has often proved a good alibi; those with an allergy to work no doubt will enjoy it the rest of their lives.

In all seriousness, however, allergy opens a new field in nutrition emphasizing the value of the special and corrective diet. If the system is sensitive to certain foods or materials, they must be avoided as much as possible. The allergy diet represents perhaps the greatest field for soy, and as yet we have only scratched the surface. Dr. Walter Alvarez, Mayo Clinic, Rochester, Minn., recommends soybeans to many allergy patients, as does every doctor interested in allergy. Dr. Albert H. Rowe, Oakland, Calif., well known in the field of allergy, in his two books, *Clinical Allergy* and *Elimination Diets and the Patient's Allergies*, discusses the use of soybeans in bakery products and in substitute formulas for milk in the diet for the study and control of food-sensitive persons.

The three most offending foods in allergy are wheat, eggs, and milk. Soy can replace all three of them; its best known use of this kind is in soy milk for those who have a milk allergy. Many babies and adults are allergic to cow's or goat's milk but

can use soy milk in both liquid or powder form. Dr. Harry Miller states that about 26 per cent of human beings are allergy-sensitive to animal milk, 6 to 7 per cent showing violent symptoms; but this group can accept soy milk and soy products.

Dr. Julius F. Muller director of allergy research of the Borden Company, says:

Most people are surprised to learn that 2 per cent of all babies are estimated to be allergic to cow's milk and show some unfavorable reaction when they take this usually nearly perfect food. Many older children and adults are also sensitive to milk and must avoid it. Allergy is a condition in which some part of the body reacts in an out-of-the-ordinary way to a food, inhalant, or contact material. During the first year of life milk allergy most commonly appears as eczema, but in many cases old-fashioned "colic" in babies is now diagnosed as a digestive symptom of milk allergy. Other symptoms appearing more frequently in older children and adults are nausea, hives, migraine headaches, and asthma.

Proteins are the usual food factor causing allergy. Although certain patients may be desensitized by proper medical treatment, and some outgrow their allergy or become naturally immunized, the usual treatment for milk allergy is complete avoidance of milk in the diet. It is readily apparent what a problem this becomes for the mother of a young, allergic infant, but a satisfactory solution is found in the use of a properly prepared soybean milk substitute. The soybean is probably the best source of nonanimal protein, and soybean oil is easily digested and bland in flavor. To be satisfactory as a milk substitute, however, careful processing is necessary as well as addition of extra amounts of carbohydrate and minerals.

There are several soy-milk products on the market. They have been fortified with fat, carbohydrate, calcium, and other minerals to equal cow's or even mother's milk. Clinical test cases show them to be excellent food, and they can be used in every way as regular milk (see page 83 and Soy Milk Recipes, page 238). Fortified soy-milk powder is also available and can be used in place of the liquid milk. Doctors, clinics, and hospitals all over the world suggest soy milk for cases of milk allergy and for cases in which the patient does not like milk or for some reason will not use animal milk. Child specialists often advise soy milk when other formulas do not agree, and it has proved a blessing when regular milk feedings could not be maintained. The Children's Hospital, Los Angeles, Calif., gives soy milk to

its milk-allergy patients. In most cases, they use the undiluted milk as it comes from the can. Soy milk has also been suggested in cases of psoriasis. Seventh-day Adventist hospitals and sanitariums that encircle the globe have done much in pioneering the soy-milk field. These large institutions serve thousands of persons and use not only the soy milk but also the fresh cheese or curd.

There are any number of "soy babies" in the United States today. Their teeth and bones are as strong and well developed as those of children raised on regular milk. Mothers who for some reason do not wish to use animal milk have substituted soy milk, and often their children have never tasted cow's milk. The same has been true in China for centuries, not because they did not want dairy milk but because they did not have it. Children readily cultivate a taste for soy milk and relish it. It is slightly more expensive than regular milk formulas.

The use of soy milk is not limited to children. Many an adult has learned its value and cultivated its taste. Soy milk, cheese, and even cereals are valuable in diets combatting excessive mucus. Many persons unable to use dairy products and heavy carbohydrate foods for this reason have found relief with the use of soy products.

The two other common allergy foods are eggs and wheat. Again soy can come to the rescue. Soybeans, soy grits, and soy flour can take the place of eggs in food value. Many a vegetarian uses a small bowl of soy grits, regular or puffed, in place of eggs for breakfast. The same menu can be used in the egg-allergy diet. Soy flour and grits mixed with grains that can be tolerated can be used for baked products and cereals in the wheat-allergy diet. The grains used depend of course upon the patient. Often there is no allergy to rye, corn, oats, rice, or barley. Soy flour may be mixed with any of these flours and used for pancakes, muffins, waffles, and cookies. Soy grits make excellent cereals when mixed with corn, oats, rye, or barley grits. The puffed or toasted grits can be added to corn flakes or any other ready-to-eat cereal that does not contain wheat (see page 247).

BLAND DIETS

Soy flour, grits, milk, and cheese are excellent foods for the bland or soft diet as well as the nonroughage diet. Soy bread

is a good source of the B vitamins and does not contain bran or the roughage of whole-wheat bread.

BUILDING DIETS

The vitamin and mineral content of the bean make it a natural protective food for every diet (see Chap. IV, page 55). It can almost be regarded as a supplement or fortifying food and has often been suggested in a bodybuilding diet. Soy flour, soy powder, and soy malts are excellent products for this purpose.

Soy flour is one of the cheapest sources of calcium known; 100 grams of calcium in soy flour costs about one-fifth as much as it does in wheat flour and one-third as much as it costs in milk. The beans also contain phosphorus and iron.

Because the soybean is a valuable source of vitamin B complex, the vitamins so necessary to healthy nerves, it has been found helpful in the prevention of beriberi and pellagra. The value of the vitamins is accentuated by the presence of lecithin. The Bureau of Science, Manila, Philippine Islands, found that soybeans are necessary in balancing the Philippine diet. They also noted a marked absence of beriberi and pellagra where soybeans are used plentifully.

William H. Adolph of Yenching University, Peiping, China, stated in 1932 that soybean milk, soybean meal, and soybean curd all had remarkable hemoglobin-regenerating power. His conclusions were based on experiments with rats. The ordinary method for producing nutritional anemia in young rats was by the feeding of cow's milk ad libitum. Rats fed on the soybean milk and other products did not contract anemia. When anemic rats were fed soybean products, there was quick regeneration of hemoglobin.

This work has been practically reproduced at Madison Collège by the feeding of litters of rats with cow's milk and with cow's milk and soy bread (12 per cent whole-soy flour). Rats fed on cow's milk were anemic; while those fed on the combination of cow's milk and soy bread made a better growth gain than even the positive-control rats, which were fed a diet of 60 per cent corn meal, 30 per cent whole-milk powder, 6 per cent linseed-oil meal, 3 per cent alfalfa-leaf meal, and 1 per cent sodium chloride. The hemoglobin content of the rats fed on cow's milk and soy bread

was the highest of any in the series, far better than that of the positive control.

REDUCING DIETS

Reducing is but "mind over platter." But how important it is to have the right foods on the platter! Tremendous harm has been done, especially to young girls, by foolish reducing diets. If the average American does not know (or in many cases does not care) how to eat for health, it stands to reason that few will know how to limit a diet sensibly as to calories. Many persons have the idea that essential foods are fattening, and as a result they literally starve themselves on foods that are supposed to be nonfattening. They nibble one day on a piece of lettuce and a cracker and have a little prepared bouillon. The next day they fall entirely from grace on chocolate cake, candy bars, or cream pie. After this divitalized carbohydrate-food spree, they starve some more on a few so-called "nonfattening" crackers; and then they wonder why they become nervous and irritable. The body on such a diet has been starved for protective essential foods, proteins, vitamins, and minerals; and the continuation of such a regime can lead only to food deficiencies and ill-health.

Unfortunately there is no magic formula for reducing. It simply requires an intake of food smaller than the amount that is daily needed so that a portion of the requirements of the body are derived from body tissues. In other words, daily caloric intake must be less than daily caloric requirements.

The sensible thing for overweight due to too many calories is to reduce by diet and moderate exercise. There is truth in the statement, "Shorten your waistline and you lengthen your life line."

A good reducing diet consists of sufficient amounts of nutritious protein, plus an abundance of low-starch vegetables, fruits, a small amount of carbohydrates, and fats, with the caloric intake less than the daily requirements.

Soybeans have been thought of as nonfattening, but the caloric rule nevertheless still holds good. The lady who eats soybeans and soy products, thinking they are nonfattening, and ignores her caloric intake should remember that a good share of the nation's hogs have been fattened on feeds containing soybean meal.

Chemically, soybeans are excellent in the low-calorie or reducing diet. They are a protective food, rich in protein, very low in starch, and with a good supply of vitamins and minerals. They are a friend indeed to anyone who is "counting the calories."

ACIDOPHILUS CULTURE

Mediums prepared from soybeans have proved excellent as cultures for *Lactobacillus acidophilus* (a friendly bacteria needed in the intestinal tract). Dr. P. A. Webber of Madison College, Tennessee, reports that the bacteria develop much more rapidly in the soy medium than in cow's milk and that they are also larger and more robust in appearance. The number of bacteria per cubic centimeter exceeds the count of milk culture by 50 to 100 per cent; and the soy acidophilus are much longer lived, retaining their vitality for many weeks. Acidophilus cultures of this kind have been on the market for years and are firmly entrenched in the dietary field.

LECITHIN

One of the latest corrective fields for soy is that of skin disorders such as psoriasis and eczema. It was often noted that, on diets high in soy, the skin would clear and in time lesions would disappear completely. So far there have perhaps been more practical applications than clinical reports. Ford Motor Company Research Laboratory records cases on this order, and Dr. E. A. Ruddiman sees possibilities in soy milk as a curative agent. Several doctors believe the value of soy in skin conditions may be due partly to the lecithin content of the bean; and soybean lecithin has often been suggested in these diets. So far it is a matter of controversy, in spite of the fact that clinical reports give excellent, even astonishing, results.

Lecithin is essential to all vital organs, including the nervous system of the body. Dr. Francis Pottenger, Jr., Monrovia, Calif., therefore believes it of great value in corrective nutrition because it supplements the diet with factors lost in the milling of our grains and the refining of our fats. Lecithin contains thermolabile factors, or unstable factors which are destroyed by heat in the refining of oils. Dr. Pottenger often uses lecithin in place of brain in the diet of his patients. The value of lecithin and the effects of its deficiency have been proved in animals.

Dr. Oscar Erf, director of official testing for dairy cattle, The Ohio State University, has done considerable research on lecithin deficiency in cattle and reports good results from the use of soybean lecithin, especially in cases of acetonemia, a disturbance of metabolism.

The beginning of the century saw an interest in lecithin as a dietary supplement; but interest waned, partly because exaggerated hopes were disappointed and partly because it was evident that experimental technique was not sufficiently developed to overcome the difficulties of lipid chemistry. Recent developments, however, again bring it to the front; and some authorities declare that it is a vital factor in the dietary field. As yet we know little of the value or use of lecithin, and it is safe to say that it will come into the foreground in the next few years. It is, among other things, a means of increasing the choline content of the diet. Dr. Albert Scharf, American Lecithin Company, New York, says that the high caloric value as well as the high content of readily assimilable phosphorus should also be borne in mind.

Lecithin for dietary purposes can be secured in liquid, jelly, and capsule form. Being fat-soluble, it is mixed with oil, usually soy or wheat-germ oil; and this mixture is made into a jelly, spread or enclosed in a gelatin capsule.

As yet we have only scratched the surface of the possibilities of corrective nutrition. It will probably become one of our greatest weapons in the battle against disease. Soybeans first gained recognition in this country as a special diet food, and there is little doubt that soy will continue to gain in popularity as a "food prescription."

Chapter VIII

Our Wonder Crop

THE history of the growth of the soybean industry in the United States is a fascinating story. In the last few years, soybeans have emerged from relative obscurity as a substitute and emergency crop to play a major part in American agriculture and to become an important item in industry, commerce, and nutrition. Today they are a vital crop, fast justifying the enthusiasm of the British pioneer who called them "the eighth wonder of the world."

JACK AND THE BEANSTALK

In the early part of the nineteenth century, the soybean was brought to this country. One hundred years later, it was still not deeply entrenched in its new home. Suddenly, however, the tide turned, and the once unimportant soybean took on new power and strode forth as the prodigy of American agriculture.

The soy industry has unquestionably made more amazing progress since 1930 than has any other industry in a land that is accustomed to magical growth in industry. In 1924, we raised about 448,000 acres of beans and produced almost 5,000,000 bushels. In 1941, or 17 years later, we raised 5,881,000 acres and produced nearly 107,000,000 bushels. This placed us third among the world's producers of soybeans, outranked only by China and Manchuria. We now challenge the Orient in production; and, if the current trend continues, we shall soon claim world leadership.

In 1942, because the American farmer rolled up his sleeves, our production was almost double that of 1941. The crop increase in 1942 results from larger acreage and higher yields. Table XIX lists soybean acreage and production from 1924 to 1941.

Table XIX.—United States Crop—Soybeans for Beans

Crop year*	Acreage	Yield per acre	Production
1924	448,000	11.0	4,947,000
1925	415,000	11.7	4,875,000
1926	466,000	11.2	5,239,000
1927	568,000	12.2	6,938,000
1928	579,000	13.6	7,880,000
1929	708,000	13.3	9,398,000
1930	1,008,000	13.4	13,471,000
1931	1,104,000	15.2	16,733,000
1932	977,000	15.3	14,975,000
1933	997,000	13.2	13,147,000
1934	1,539,000	15.0	23,095,000
1935	2,697,000	16.5	44,378,000
1936	2,132,000	14.1	29,983,000
1937	2,549,000	17.8	45,272,000
1938	3,105,000	20.2	62,729,000
1939	4,417,000	20.7	91,272,000
1940	4,779,000	16.1	77,374,000
1941	5,855,000	18.9	106,712,000

Courtesy of Edward J. Dies, *Gold from the Soil*.

* Oct. 1 to Sept. 30.

Table XX.—Figures from the Crop Reporting Board for the Last 3 Years

Crop year	Acreage	Yield per acre	Production
1941	5,881,000	18.0	105,587,000
1942	10,008,000	18.7	187,155,000
1943	10,820,000	18.1	195,762,000

Markley and Goss, *Soybean Chemistry and Technology*.

There is usually a variation in current figures until all reports are in from the field, industry, and government.

Soybeans have been raised successfully from Maine to the Pacific coast, from near sea level to an altitude of 8,000 feet. They will grow wherever corn will grow, and a vast garden of soybean crops extends through the Middle West and into the South.

Our five high-producing states are Illinois, Indiana, Iowa, Ohio, and Missouri. Illinois is the "soybean state," Champaign County is the heaviest producing county, and Decatur is the "soybean capital."

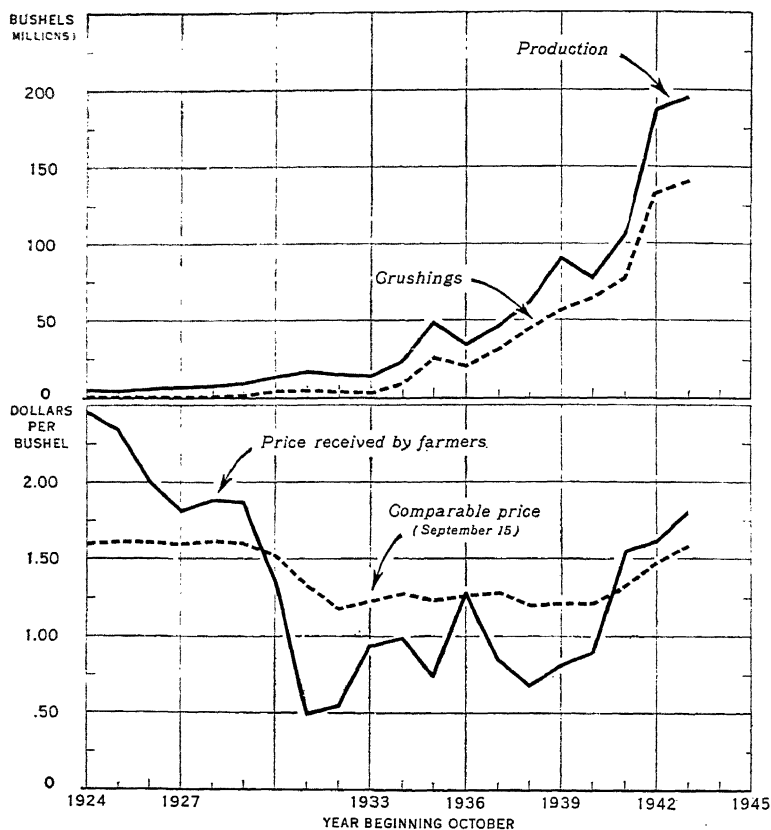


FIG. 7.—Soybeans harvested for beans: production, crushings, and price, United States, 1924–1943. Production and crushings for 1943 estimated on basis of December 1 indications. (U.S. Department of Agriculture Bureau of Agricultural Economics.)

Our soy garden is expanding, as shown by Table XXI.

Today, soybeans are one of our major cash crops, exceeded only by cotton, wheat, corn, and tobacco. As a national industry, they are more than a hundred million dollar business and have been doubling in size every 4 years. To the farmer, they have been a good dollar-and-cents proposition. In many cases, they

have been his best cash crop, selling for more than wheat and for about twice as much as corn.

Table XXI.—1943 Acreage by States
Grown Alone for All Purposes
In thousands of acres

State	Average 1932-1941	1942	
New York.....	10	34	34
New Jersey.....	18	60	75
Pennsylvania....	46	108	144
Ohio.....	488	1,440	1,598
Indiana.....	895	1,728	1,800
Illinois.....	2,095	3,940	4,216
Michigan....	74	274	170
Wisconsin..	159	160	120
Minnesota..	127	413	351
Iowa.....	884	2,202	2,312
Missouri.....	482	700	798
North Dakota.....		.....	15
South Dakota.....		19	40
Nebraska.....	10	55	110
Kansas.....	50	290	392
Delaware.....	38	66	82
Maryland.....	48	100	125
Virginia.....	114	196	245
West Virginia.....	49	40	49
North Carolina.....	276	434	486
South Carolina.....	27	48	53
Georgia.....	78	106	138
Kentucky.....	133	224	280
Tennessee.....	158	224	276
Alabama.....	225	298	313
Mississippi.....	254	500	550
Arkansas.....	173	330	409
Louisiana.....	65	155	166
Oklahoma.....	14	32	35
Texas.....	25	46	52
United States total.	6,999	14,222	15,434

Courtesy of Soybean Digest.

Soybeans today lead all other oil-seed crops in cash return to the farmer. The Bureau of Agricultural Economics, in its June "Fats and Oils Situation," list the cash value to farmers of soybeans sold in 1942 as 231 million dollars, as compared with

million dollars for cottonseed, 96 million for flaxseed, and 83 million for peanuts.

EARLY HISTORY

Success is often taken for granted by the public; and they seldom realize the hard work that has gone into the advancement of an individual, a movement, or an industry. Many an envious bystander believes that the recipe of success is the courting of luck, but the individual who has attained his goal knows that it is the perspiration added to his luck that has brought results.

Every industry has its problems and growing pains, and the soy industry has had its share and perhaps a bit more. The burden has been borne not by one group alone, but by all. Agriculture, science, commerce, and industry have all put their shoulders to the wheel. From the very start, they have been faced with the great problem of education. The soybean is not a native plant; it was only an Oriental curiosity that had to be Americanized. That meant getting seed; studying varieties; teaching the farmer to grow them; finding uses for the bean, the oil, and the meal; and fitting them into the American diet. The last is our present-day problem, brought to a climax by the war and by our present protein shortages.

The soybean was graduated from the front yard, where it had been grown as a curiosity, to the field as a hay or forage crop. It was also grown for soil improvement. It became popular in certain regions as a replacement crop for oats on sour soils where clover would not grow. Still we had not tapped the protein and oil resources of the bean.

It is of interest to note that the first soybeans processed in this country were grown across the Pacific. In 1911, Herman Meyer opened a small crushing plant in Seattle, later known as the Pacific Oil Mills. He bought the beans from Manchuria and crushed them for oil and meal. He sold the meal to farmers for livestock, and he disposed of the oil locally for industrial purposes. The venture failed because America was not interested in soybeans.

The next venture was in Elizabeth City, N.C., in 1912; this time a small quantity of domestic beans were processed. There also, in the fall of 1915, the first domestic soybeans were crushed for commercial purposes. These small ventures started the ball

rolling; and as time went on other mills were started for the processing of the beans. North Carolina at that time was one of the soybean states; and the first large crushing experiment, 30,000 bushels, was made there in 1916.

The next problem was what to do with the oil and the meal. The meal made excellent livestock feed, but the farmers had to be coaxed, almost forced, to try it on their cattle. New uses had to be discovered for the oil, and much of it found its way into the automotive industry. Then growers had to be interested in raising soybeans and had to be convinced that they were a profitable crop.

The soy industry struggled to its feet in the next few years. The soy garden spread to the Middle West, where processing mills also made their appearance. The birth and growth of soybeans in America are ably described by Edward Jerome Dies in his book *Soybeans: Gold from the Soil*.

Then came the First World War and with it a great need for fats and oil. Now soybeans were given their first real chance. Because fats and oils are necessary to war, large quantities of soybean oil were imported from Manchuria. It was often of poor quality and shipped in containers that made it unfit for human consumption. As a result, we turned to the soybean as a domestic source of oil. Oil made from soybeans grown in America was used for industrial purposes, and it also entered the American kitchen for the first time. The industry was short-lived, however, and began and ended more or less with the war. As yet, we were not ready for soybeans. We had not learned to utilize the beans for industrial purposes, we did not know how to prepare or even how to grow the edible varieties, and we did not know how to process soybeans for human food or efficient animal rations. A few scientists, however, saw the value of the beans in the First World War and prophesied a great future for them. We are proving these prophecies in the Second World War.

NEW VARIETIES

Gradually, various varieties of soybean seeds found their way to this country via missionaries and travelers. We received two varieties from the Perry expedition. In 1898, the U.S. Department of Agriculture began the introduction of soybean seeds

from Asia. By 1907, our varieties had increased from eight to twenty-three. Of these twenty-three varieties, fifteen were brought in by the U.S. Department of Agriculture, and eight were imported by individuals from either the Orient or Europe. By this time, most of our agricultural experimental stations were interested in them; but up to 1914 our total acreage was only in the neighborhood of two thousand acres. The beans were grown entirely as a hay crop, for animal feeding, or for soil improvement, with no thought for human consumption.

The Department of Agriculture has made more than ten thousand introductions from China, Manchuria, Japan, Chosen, Java, Sumatra, and India; and today we have more than two thousand five hundred distinct varieties, types, and strains. We have concentrated our efforts on some sixty to a hundred varieties, ranging in maturing time from 75 to more than 200 days.

Much of the work in securing new seeds has been done by W. J., or "Bill," Morse, known in the industry as the "daddy of soybean growing in the United States." William Joseph Morse has been in the Department of Agriculture since 1907, when he got his degree from Cornell University; and every day of that time he has been living and talking soybeans.

In 1929, he took his family, went to the Orient to collect samples of seed, and spent 2 years moving from one country to another gathering soybeans. He was joined in this work by P. H. Dorsett, one of the most famous of all department plant explorers. Whenever they found a new variety that showed promise for culture in the United States, they sent home a sample of the seed. By 1931, when Morse returned, the collections had totaled over six thousand. Plant breeders of the department and at several of the state experimental stations went to work crossing and recrossing the Morse and Dorsett collection, until now there is a special variety available for practically every locality, condition, and demand.

We have commercial varieties from 12 or 15 inches in height in the North and more than 6 feet high in the South. The stems range in size from as fine as clover stems to as coarse as small cornstalks. Soybeans vary in size from the small bean with approximately seven thousand seeds per pound to large ones with twelve hundred seeds per pound. The bean varies in color from a very pale or straw yellow to jet black, and from a low oil con-

tent of 12 to 13 per cent to a high of 20 to 22 per cent, with protein content ranging from as low as 33 per cent to as high as 45 per cent. The demand since 1939 has been for the yellow seeded variety with a high oil content.

There has been considerable demand for edible varieties. The U.S. Department of Agriculture and all state experiment stations have done intensive research on these types, and several new varieties are on the way. Beans are being developed for better standing quality, less shattering, earlier maturing, more disease resistance, better content and quality of oil, greater yield, and better flavor (see Chap. IX, page 150).

AIDS TO THE INDUSTRY

In 1936, the Federal government officially recognized the increasing importance of the soybean crop and established a Regional Soybean Industrial Products Laboratory at the University of Illinois, in Urbana. The laboratory was established for the purpose of studying the bean, developing new uses and new outlets for the crop, and improving the bean itself and the products already being made from it.

The original scope of the laboratory included only the states in the major soybean-growing areas. It has now been extended to the North Central states and 12 Southern states. The work of this laboratory has been invaluable to the industry. Dr. W. J. Morse, senior agronomist, Bureau of Plant Industry, Washington, D.C., at the War Conference of the American Soybean Association, summarized its emergency program as follows:

The original work program of the laboratory involving agronomic genetical, physiological, and pathological investigations has been somewhat modified for the period of the war emergency. The physiological and purely genetic problems are being postponed, while greater emphasis is being placed on the development and distribution of adapted varieties of superior quality, improved cultural methods, and the study and control of diseases for the maximum production of feed, food, and industrial products under varying conditions of soils, climate, and farm practices. Thus the laboratory program for the war emergency period includes the following objectives:

1. To determine the effects of varietal, soil, and climatic factors, and cultural and production methods on the growth, yield, and composition of soybeans.

To develop by breeding through selection from hybrids and other supported by data from chemical analyses, varieties of soybeans of superior quality for industrial purposes.

3. To study methods of control for the most serious soybean diseases and the possibilities of developing strains highly resistant or immune to these diseases.

In July, 1942, the President of the United States signed agricultural appropriations transferring a part of the U.S. Regional Soybean Industrial Products Laboratory from Urbana, Ill., to the Northern Regional Research Laboratory at Peoria, where research is now done on soybean production as well as on corn and wheat production. The potentialities of chemical research on such farm products as corn and soybeans are well illustrated by the laboratory's recent development of a rubberlike material, tentatively named Norepol, which is typical of the results that may come from any well-planned research program (see Chap. III, page 40).

Recent changes in our food program have focused attention on soy flour and grits as a source of protein in our diets, and work on these products has therefore been included in the research program of the Northern Regional Research Laboratory.

The American railroads, in addition to their education work on soybeans, have worked with the industry in establishing processing plants. They came to the aid of the processor by interesting the farmer in growing more beans to keep plants running all year. As production increased, they aided the farmer in establishing plants to take care of his crop.

The American Soybean Association has played an increasingly important role in the development of the soy industry. Primarily a growers' organization, the association acts as a coordinating agent for the many branches of the industry, from processor to handler to government and research men and commercial utilizers of soybeans and soy products.

The association was organized on the first national soybean field day at Fauts Brothers Soyland Farm, Camden, Ind., in 1920, and Taylor Fauts was its first president. The silver jubilee was held at the University of Illinois in September, 1944. The association's headquarters are at Hudson, Iowa, where the secretary's office is a busy place. They try to answer the thousands of questions that arise in a new industry forced into vast expan-

sion by a world war. Letters come from all over the world, asking for the most diverse information, from technical details on processing to the advisability of growing soybeans in orange groves or under irrigation.

The official publication of the association is *The Soybean Digest*, which was founded by George Strayer in 1940 and is published at Hudson, Iowa. The *Digest* ambitiously tries to serve the interest of every branch of the industry and has made a rapid growth in influence and circulation since its inception.

Two other associations that have aided the development of the industry are the Soy Flour Association and the National Soybean Processors Association, both now under the able direction of Edward J. Dies.

The Soy Flour Association, with Edward Kahl as first president, operated for several years as an informal group on problems of mutual interest and was formally organized in 1939. Its purposes are those of the customary trade association, but in addition it has spent a considerable sum on research projects, educational and promotional efforts, and the dissemination of technical information. In January, 1943, it opened the Soya Kitchen in Chicago for the purpose of testing and preparing recipes for soy flour and soy grits. This is merely a step in the national educational program that is to come. A national education program has not been possible without national distribution, and up to now the industry has not been ready for that.

The National Soybean Processors Association is another trade organization, composed of many processors working together for the interests of the industry.

Processing concerns are largely responsible for the industrial development and have spent years of research and vast sums of money in developing and perfecting new products from the beans. They have also aided farmers and interested them in producing more beans. Processors have given us soy flour, soy grits, and all the other food products that are proving so valuable today.

The National Farm Chemurgic Council regards soybeans as its best chemurgic crop. "Chemurgy" is a coined word, from "chemistry" and the Greek word *ourgos* meaning "worker." The council's objective is to advance the industrial use of American farm products through applied science. The council

has been instrumental in opening new industrial channels, and its work will be far-reaching in the postwar era.

EDUCATIONAL PROGRAM

The education of the farmer is not over; in fact the present shortages and demands present an educational opportunity that the industry cannot afford to miss. The proper educational program now will establish soybeans on the American farm. Many farmers are not yet successful growers, many of them are just considering raising soys, and just as many are potential users of soy animal feeds. There is still definite need for educational classes for the farmer. Dr. R. C. Cassell, associate professor of agriculture at South Illinois Normal University, has tried to fulfill this need in southern Illinois. He believes that adult-education meetings are the most logical approach to the farmers' problems. As a result, he organized soybean war production classes that have met 2 hours each week for a 10-week period and have proved very popular. Bulletins, soil-testing kits, exhibits, movies, and lectures have made the classes practical and interesting. A practical educational program now for the grower will pay dividends for the entire industry after the present emergency is over.

The trend of the industry has changed since its start as a forage crop. With each change has come a new educational problem. Soybeans have taken on new importance and have entered the field of nutrition as one of our most vital food crops. The soybean industry today is the largest producer of vegetable oil and the largest source of the protein concentrate so necessary to balance rations for quicker, better production of meat, milk, and eggs or to take the place of or supplement them in the diet.

Again there is a problem of education. At first it was the farmers who needed education, then the processor, then the industrial user, and now it is the housewife. It is she who is going to feed soybeans to America, and she must know how to use them. The lack of distribution of soy products and the lack of recipes and suggestions for them are both great handicaps at the present time.

Soybeans are news today. Newspapers and magazines have featured them as sprouts, meat, or wool. The result is that

America is becoming soybean-minded, and housewives are eager to try them. Even the skeptical male who once scorned them is now curious to know how they taste and in some cases is even bragging of his skill in making soy flapjacks.

It is essential that the bean, the flour, the grits, and other products reach the corner grocery store as soon as possible. Up to a few months ago, their sale was limited; and, unless a region had a health-food store, soybeans and soy products were not to be had. Our present accent on good nutrition and our recognition of nutritional deficiencies, including the lack of sufficient protein which has existed for years, plus the Second World War and rationing, have created a demand for soybean products that never could have been brought about by educational means. With this demand, however, must go recipes for palatable dishes and an opportunity to acquaint the public with them.

Manufacturers with national distribution will do their part in this educational program for the housewife through the printed page, radio, and cooking classes. Some of the soy-flour companies have, at great expense, had elaborate cooking tests made of their products. The resulting recipes are now being made available for general distribution. Other concerns selling soy products are compiling recipe folders that will go in their packages or be distributed separately.

The U.S. Department of Agriculture Division of Home Economics has carried on exhaustive tests and has released recipes for soy flour and grits. Home-food economists of the large magazines and newspapers have been and are experimenting on soy in their kitchens, and many soy recipes are appearing in their pages.

Nutritional classes, parent-teacher groups, school lunches, and community feeding groups are all means of education and are important in establishing soy as a food in this country.

The National Food Distributors, National Association of Food Chain Stores, and the National Retail Grocers' Association have all helped to pave the way for merchandising and are enthusiastic over the reception of soy pancake and waffle mixes. The National Macaroni Association has organized a program for soy macaroni products. The Bakers' Association and the National Hotel Association are aiding the soy food program, as are many other food associations.

To keep claims within bounds and on a constructive basis, the Soy Flour Association has organized the Soya Food Research Council. E. L. Rhoades, secretary of the association, gave this report at the American Soybean Association War Conference:

To make sure that this new protein food is launched and handled on a sound, scientific basis, there was organized by the Soy Flour Association, the Soya Food Research Council, among its members outstanding scientists of the industry, and operating on a policy that all developments must be nutritionally sound, regardless of commercial temptations to operate on less constructive lines. Public nutritional authorities in Washington and elsewhere in the United States are personally cooperating with this new council in a very healthy manner. Three specific research projects have already been placed by the council in universities of highest rating, and other scientific problems will be approached in the same manner by competent, unbiased scientists to guard this food development along sound and permanent lines.

Thus the soybean, in its American dress, is launched on a national food program—one that will mean better nutrition for the entire world.

RESTRICTIVE REGULATIONS

The dizzy rise of the soy industry and the acceptance of possibilities of soy products in the United States have not gone unnoticed in competitive fields and have often resulted in keen commercial wars. Each individual or industry zealously tries to protect its interests and frowns upon any competitor that seems likely to develop into a lively rival.

As a result, trade barriers, as they are termed, in the form of restrictive laws and regulations have been passed against some products. The soy industry has not been exempt from such trade barriers. The restrictions are not on soybeans themselves but on products using soybeans. One restriction is in the margarine field. Margarine is restricted from coloring in certain states, and soy oil must therefore be bleached because it gives the margarine a natural golden color. Soy oil, however, can be hydrogenated and used in margarine with excellent results, and most margarines now contain it. Many states require excise taxes or license fees on the making and selling of margarine, and these retard its sales. If trade barriers were removed, the sale of margarine would increase millions of pounds, and millions of

consumers could afford to buy it. Those in favor of removing the restriction argue that it would not affect butter sales, since most of the consumers of margarine in normal times cannot afford to buy butter.

World shortages open up an entirely new argument, and it remains to be seen if some of the restrictions will be removed. With butter shortage, margarine becomes almost a necessity. Some states such as California have already relieved the grocers of paying the \$5 margarine fee. In some states, the removal will not be so easy or simple.

Lend-lease has opened up new channels for colored margarine. The following story is taken from the December, 1942, issue of *The Soybean Digest*:

One of the substantial new outlets for soybean oil under the war emergency is colored margarine, large quantities of which are being purchased by the Agricultural Marketing Administration for Lend-Lease shipment to our allies.

In 1941, very little colored margarine was produced, due to the prohibitive tax on it in most states. But there is no tax on such margarine when purchased by the government, and 60 million pounds of margarine have been bought for Lend-Lease since its inception.

Soybean oil has been largely the beneficiary of this new business. According to figures given us by the National Association of Margarine Manufacturers, total production of colored margarine for the two months of August and September of this year was over 24.5 million pounds. Of this amount, over 17 million pounds, or 69 per cent of the total, were soybean oil, not taking into consideration lecithin or derivative of glycerin which may be soybean products.

Similar trade restrictions face the makers of bologna and sausage. Here the great difficulty is that soy protein is so like the protein of meat that the chemist has trouble distinguishing between the two. For this reason, soy may be used in certain meat products and not in others. For instance, Federally inspected plants cannot use soy in their cased goods such as bologna and sausage. They can use it only in loaves not marked "meat," as in luncheon loaf, pimiento supreme, and the like. At the same time, government specifications have called for the use of 22 per cent soya flour with 12 per cent added water and 66 per cent pork trimmings in making pork-soy links for Lend-Lease. Great Britain has welcomed the addition of soy in sausage and

similar products to increase their protein content. Soy has proved a marvelous means not only of stretching our meat supply but also of supplementing it with high-quality protein. Nutritionally, soy is better than the cereal fillers now allowed in many meat products. Many meat packers, under rationing, faced with the problem of making the meat supply go as far as possible, would welcome the addition of soy in their products. Adjustments can be made, and proper labeling of all these products will inform the public of the addition of the soybean.

Soy milk is so far only a drop in the national milk bucket, but even so, certain states regard it as imitation milk and require licenses and fees for its manufacture and sale (see Chap. V, page 85).

The ice-cream situation is another problem. When the government curtailed the use of dry skim milk and limited the serum-solids content of a mix, ice-cream manufacturers were faced with the problem of finding a product that might be used to replace or compensate for a portion of the reduction made necessary by government rulings. Research men found that a low-fat soy flour of less than 1 per cent could be satisfactorily used to the extent of 20 per cent in ice cream.

A. D. Burke and Douglas Flanagan of the dairy department, Alabama Polytechnic Institute, Auburn, Ala., prepared several formulas that have been widely publicized. In some formulas, the addition of soy flour actually improved the body and texture of the frozen mix. Here is a solution or a part solution to the cutting down of skim milk, and many ice-cream concerns are happy to use it. But again regulations in certain states forbid the use of soy flour in this capacity. For instance, the California law states that "no product containing any fat other than dairy fat" can be used in ice cream and ice milks. Low-fat soy flour contains less than 1 per cent of fat but cannot be used until the regulations are changed by the California State Legislature. It has been found, however, that this same flour acts as a stabilizer and can be used as the whole or part of the stabilizer. The extent is not more than 0.6 per cent, which is not worth bothering with.

A controversy at the present time that has caused national rumblings is the amazing proposed ruling of the Pure Food and Drug Administration limiting the use of soy flour in bread to

insignificant amounts and even classing it as an adulterant in white bread. As yet no one can understand the reason for the lack of unity and conflicting policies by the various government bureaus. On one hand, the Department of Agriculture proves the nutritional value of soy in bread (see Chap. IV, page 68), asks the farmers to increase their crops greatly for the war food program, endorses soybeans as one of our best emergency foods, and uses it for Lend-Lease. On the other hand, the Pure Food and Drug Administration proposes to forbid its use in the product where it can do the most good for the American people. The proposed bread standard would limit the use of soy flour in white bread to $\frac{1}{2}$ of 1 per cent.

Great Britain and Canada have taken an entirely opposite attitude. They welcome the addition of soy in bakery goods to raise the nutritional value of everyday foods. A recent British test showed that, by adding 2 per cent of soy flour to ordinary white bread, the protein content was increased 22 per cent. In Canada, 1 to 2 per cent has often been added to white breads and from 3 to 5 per cent in dark breads, giving a protein increase of 20 to 35 per cent without altering the flavor or color of the breads. What the outcome of this ruling will be no one knows, but the chances are that national pressure will allow soy flour to win out on its own merits.

Such is a brief panoramic view of our wonder crop, our Oriental importation that has changed the American farm, put new life into commerce and industry, and is now revolutionizing our food habits. The soy industry has come far in the last few years, and its future is bright and promising.

Chapter IX

Soybeans and the Farmer

THE adage, "Don't count your chickens before they are hatched!" is very good advice for the individual who suddenly becomes enthused over the raising of soybeans and sees in them the solution for any unprofitable land he happens to have the misfortune to own. Somehow he has the idea that all he has to do is to put the seeds in the ground and gather in the money; little things such as locality, soil, proper seeds, diseases, and pests or harvesting never enter his imagination to spoil the rosy picture.

GROWING SOYBEANS

Soybeans do grow easily, do mature quickly, and do not require a great deal of care; but every successful soy farmer has had plenty of problems and headaches and even losses of his crop. The prospective farmer or even gardener will find it a good investment to study the soybean thoroughly before he plants it. This chapter is by no means a technical discussion of soy culture. It is only a stressing of the high lights, attempting to familiarize the reader with a few problems of the farmer.

Public attention has been focused on soybeans ever since they first began to enter the industrial world, and now the war has forced them into the limelight as a vital war and food crop. Our government, realizing the value of fats and oils, made plans to increase the production of soybeans even before our entry into

the war. In 1942, the Department of Agriculture asked farmers to increase the planted areas to nine million acres, and "soybeans for victory" became the slogan. The Department of Agriculture sent out folders urging the farmer to plant soybeans for oil, paints, food, and meal. As a result, the 1942 crop was almost double that of 1941; and today we are bidding for world leadership in the production of soybeans.



FIG. 8.—J. E. Johnson, president, American Soybean Association, in the center of a mile-long field of soybeans.

The city dweller too has had his interest aroused in the beans, and many a victory garden contains the edible type. Here is where we are going to get firsthand experience with the beans and get a chance to know them and to develop a taste for them. This in turn may have considerable influence on our national diet. The author has enjoyed growing edible soybeans in the garden and has had excellent results. Three 15-foot rows supplied her family with an abundance of green beans and a few dry beans, and the plants have been interesting curiosities to the neighbors.

Soybeans will grow wherever corn will grow. They have been raised successfully in the United States from the Atlantic coast

to the Pacific coast, from Mexico to the Canadian border, from sea level to an altitude of 8,000 feet. But that is not proof of a profitable crop in the wide-open spaces or on the farm that has never been a paying proposition.

VARIETIES

All varieties of soybeans may be divided into three special-purpose groups:

1. Forage types: beans that produce an abundance of stems and leaves suitable for hay and green feeding and are comparable with alfalfa in food value. Generally these types have black or brown seeds and are for the most part smaller seeded, finer stemmed, more leafy, and have less oil content than yellow-seeded varieties.

2. Industrial or commercial types: beans that have a high oil and protein content. The oil mills prefer yellow varieties high in both protein and oil. Black- and brown-seeded varieties with low oil content are discounted on commercial markets.

3. Edible or vegetable types: beans that are palatable as a human food. They are usually larger, easier to cook, and have a better flavor than commercial types.

One of the most important and one of the first problems of every grower and gardener is choosing the right variety of seed for his locality. The secret of successful soy farming hinges on this fact. Each region must find the variety best adapted to it. Soybeans in Hawaii, for instance, can be a valuable food crop, if the right varieties for that region are selected (see Chap. II, page 27).

Factors for the grower to consider are the length of the growing season, the type of soil, the method of planting, the method of harvesting, the degree of fertility of the soil, the date of planting, and the method of cultivation. All these factors make a difference. One type of bean, for example, may show standing quality, early maturity, and high yield on a heavy black soil with plenty of moisture; yet it should never be used for high ground or sandy soil, because there are several varieties that will mature there and excel it in yield. Beans suitable for the South are not suitable for the North. At the present time, each of the varieties grown extensively has a definite place in the soybean-producing program and is good in that one place. The successful

farmer selects the beans that suit his place and purpose. The U.S. Department of Agriculture and all the regional laboratories are working to perfect varieties and strains adapted to our soil, season, harvesting purposes, and even our tastes. The next few years will give us improved strains that will mean much to the industry. Today, there are commercial varieties to meet practically every demand and condition. Every grower should get in touch with his county agent or state agriculture college if he is not sure of the commercial value of the variety of soybeans he contemplates using.

The following list gives varieties that are suggested for different uses classified as to length of growing season:

Very early (100 days or less):

Seed.....	Cayuga, Mandarin, Minsoy
Forage.....	Cayuga, Chernie, Ogemaw, Soysota, Wisconsin Black
Green vegetable.....	Agate, Sioux

Early (101 to 110 days):

Seed.....	A.K., Aksarben, Dunfield, Elton, Habaro, Hoosier, Illini, Ito San, Manchu, Mandell, Mukden, Pinpu, Richland, Wea
Forage.....	A.K., Black Eyebrow, Chestnut
Green Vegetable.....	Bansei, Chusei, Goku, Kanro, Waseda
Dry edible.....	Bansei, Chusei, Goku, Kanro, Waseda

Medium early (111 to 120 days):

Seed.....	Harbinsoy, Hongkong, Mansoy, Midwest, Scioto
Forage.....	Harbinsoy, Ilsoy, Medium Green
Green vegetable.....	Fuji, Hakote, Hiro, Hokkaido, Jogun, Kura, Osaya, Sato, Shiro, Sousei, Suru, Toku, Willomi
Dry edible.....	Hokkaido, Jogun, Osaya, Sousei, Suru, Toku, Willomi

Medium (121 to 130 days):

Seed.....	Hurrelbrink, Macoupin, Yokoten
Forage.....	Columbia, Ebony, Kingwa, Lexington, Norredo, Ozark, Peking, Pine Dell Perfection, Sooty, Virginia, Wilson, Wilson-Five
Green vegetable.....	Chame, Funk Delicious, Imperial
Dry edible.....	Funk Delicious, Imperial

Medium late (131 to 140 days):

Seed.....	Arksoy, Chiquita, Dixie, Easycook, Haberlandt, Herman, Hollybrook, Morse, Southern Prolific, Tokyo, Wood's Yellow
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Forage.....	Chiquita, George Washington, Laredo, Mammoth Brown, Old Dominion, Tarheel Black
Green vegetable.....	Aoda, Hahto, Higan, Rokusun
Dry edible.....	Easycok, Haberlandt, Higan, Rokusun, Tokyo
Late (141 to 160 days):	
Seed.....	Clemson, Delsta, Hayseed, Mamloxi, Mammoth Yellow, Mamredo, Missoy
Forage.....	Barchet, Clemson, Hayseed, Missoy, Pee Dee, Southern Green
Green vegetable.....	Nanda
Dry edible.....	Nanda
Very late (161 or more days):	
Seed.....	Charlee, Creole, Delnoshat, Georgian, Monetta, Nanking, Palmetto, White Biloxi, Yelredo
Forage.....	Avoyelles, Biloxi, Charlee, Creole, Georgian, Monetta, Oloxi, Otootan, Palmetto, Yelredo
U.S. Department of Agriculture, <i>Farmers' Bulletin</i> 1520.	

Two new varieties of soybeans, the Earlyana and the Lincoln, are being watched with great interest. Walter W. McLaughlin, speaking as a grower, reported on these two varieties at the American Soybean Association War Conference held at Cedar Rapids, Iowa. The Earlyana, developed by the Purdue University Agricultural Experiment Station, is satisfactory in oil content and is thought to show great promise as an early bean. The Lincoln is one of the outstanding selections that has been developed to date. The University of Illinois College of Agriculture has been greatly interested in this bean, which is high in both yield and oil content. Mr. McLaughlin believes that the Lincoln ranks ahead of the best standard varieties now being grown and that it will become one of the leading varieties of soybeans in the future. This does not mean, however, that it is satisfactory for all soils or climates.

From Wisconsin come favorable reports of the Mendota developed by O. B. Combs, Department of Horticulture, Wisconsin College of Agriculture. The plant is 28 to 30 inches high, bears purple flowers in 40 to 45 days from seeding, and reaches complete maturity in 115 to 120 days. It has proved excellent for canning and freezing.

Table XXII lists the common yellow or yellowish-green bean and black and brown hay varieties.

The same rules for variety hold true of the edible types. Many an enthusiastic gardener, with visions of growing meat on vines

in his back yard, has dashed into a feed store for soybeans only to discover when he tries to eat them that he did not purchase the edible type. The difference between edible and commercial types may be compared with the difference between Golden Bantam corn and yellow seed corn. The edible seeds were difficult to obtain up to 1940, but now practically every seed house lists one or more varieties. Edible whole beans purchased in food stores will grow and can be used for seed.

Table XXII.—Common Varieties of Soybeans

Regions or states	Commercial yellow or yellowish-green soybeans	Hay beans—black or brown soybeans
Eastern United States, Michigan, Wisconsin, Minnesota, South Dakota, northern Iowa	Harbaro, Manchu, Mandarin, Mandell, Minsoy	Black Eyebrow, Cayuga, Wisconsin Black
Northern Ohio, Indiana (northern two-thirds), southern Iowa, Illinois (northern two-thirds), northern Nebraska	Dunfield, Illini, Manchu, Mandarin, Mandell, Mukden, Richland, Scioto	Black-Eyebrow, Ebony, Ilsoy, Peking
Southern Ohio, southern Indiana, southern Illinois, Missouri, northeastern Kansas, southern Nebraska	Chief, Dunfield, Illini, Macoupin, Mansoy, Morse, Mt. Carmel, Patoka	Ilsoy, Kingwa, Laredo, Virginia
Arkansas, Kentucky, Missouri, Oklahoma, and the South	Delsta, Herman, Mammoth Yellow, Mamredo, Tokio	Laredo, Ootootan

Courtesy of John Deere, "Soybeans for Profit."

Edible types will grow where other beans grow, and the yield will be much heavier. The home gardener plants them as he does peas or other beans. Authorities say that a minimum space of 2 feet between rows is needed for handling the crop, whether it is grown for green beans or for mature seeds, and that placing the seeds 1 to 2 inches apart in the rows has been found the most satisfactory.

Edible types vary in their time of maturity. If two or three varieties of different lengths of maturity are planted, green soybeans can be had over a period of many weeks. The shelled

THE USEFUL SOYBEAN

Table XXIII.—Relative Earliness of 18 Varieties of Soybeans Grown at Urbana, Ill., 1934-1938
(Planted May 17, 1934; June 5, 1935, May 28, 1936, May 20, 1937, May 13, 1938)

Variety	Number of days to blooming*					Number of days to edible condition†					Number of days to maturity‡					
	1934	1935	1936	1937	1938	Aver.	1936	1937	1938	Aver.	1934	1935	1936	1937	1938	Aver.
Very early:																
Giant Green.....	..§	..	47	40	44	40	88	90	95	91	...	...	103	112	111	109
Early:																
80494||.....	97	47	50	50	54	48	89	92	100	94	104	113	109	118	116	112
Bancal (81031).....	27¶	43	54	52	57	52	95	94	100	96	124	112	110	116	118	116
Fuji (81026).....	40	47	54	55	58	51	95	96	107	99	104	112	110	120	122	114
Middle season:																
Illini.....	55	57	57	57	58	57	95	100	103	99	130	...	122	125	126	126
Hokkaido (85666).....	47	50	54	55	59	53	101	99	113	104	124	115	124	123	138	125
Jogun (87015).....	47	50	50	55	58	52	98	102	107	102	124	119	118	124	134	123
Willom (81044-1).....	42	51	57	55	57	52	102	102	105	103	124	125	126	123	135	127
80490-1.....	38	47	61	53	55	51	105	100	108	104	124	119	130	123	127	123
89102.....	44	54	60	57	57	53	99	96	106	100	125	...	137	125	125	128
84970.....	46	54	65	70	70	59	96	104	109	103	125	...	137	131	137	133
87017.....	...	57	55	55	55	50	100	96	99	98	...	...	137	120	120	126
Late:																
Illington.....	...	61	63	69	69	64	109	110	114	111	...	...	142	131	136	136
Imperial (81780).....	47	52	61	61	64	57	...	107	114	111	124	125	145	133	138	138
87006.....	...	62	64	68	72	67	105	110	110	108	...	118	140	134	138	135
Funk Delicious.....	...	...	64	61	60	62	107	110	116	111	...	145	145	133	138	139
Emperor (97155).....	62	64	67	72	72	66	105	111	118	111	...	125	154	130	145	141
Illigan (80475).....	...	64	70	74	80	69	113	115	123	117	...	...	142	138	145	142
Average.....	44	51	57	58	61	56	100	102	108	103	121	117	130	126	131	127

* Blooming date, when 50 per cent of the plants showed some open blossoms. † Edible date, when about 80 to 85 per cent of pods were well filled. ‡ Maturity date, when pods had turned to their mature color and become fairly dry. § Blanks in these tables indicate either that the variety was not included in the tests that year, or that data on the particular point were not secured. ¶ Not included in average. || The serial numbers, used either alone or in parentheses following a variety name, are the designations under which the varieties were originally sent out by the Bureau of Plant Industry, U.S. Department of Agriculture. Several have since been named.

Courtesy of University of Illinois Agricultural Experiment Station.

beans are excellent as a green vegetable and, when they become too old for this stage, can be used as dry beans or for seed if they are allowed to mature.

SOURCES OF INFORMATION

Anyone planning to raise soybeans for profit or food should make a thorough study of locality, soil, type of beans, and the individual culture of the variety used. Detailed information can be secured from any of the agricultural experiment stations of the soy belt or from the U.S. Department of Agriculture. *Farmers' Bulletins* 1520, 1605, 1617, and 1937, U.S. Department of Agriculture, will prove helpful. Detailed local information should also be secured from the local county agent or from the state agricultural experiment station. The universities of the Middle West all have bulletins on vegetable or edible types of soybeans. *Bulletins* 443, 453, and 462 from the University of Illinois, Urbana, Ill., are excellent sources of information. They also have a free bulletin entitled *Soybeans from Your Victory Garden*.

Purdue University in 1942 published a complete booklet and film strip on the production, improvement, and utilization of soybeans in Indiana as an instructional aid for teachers of vocational agriculture. Machinery concerns selling farm equipment suitable for the production of the beans often publish detailed booklets that are both interesting and instructive.

The American Soybean Association at Hudson, Iowa, is another source of information. Their publication, *The Soybean Digest*, serves the entire industry.

SEEDING AND INOCULATING

Best results are obtained from a well-prepared seedbed. Successful growers have found that extra efforts pay dividends. Hence they are as careful in preparing a seedbed for soybeans as in preparing one for corn. The seedbed should be mellow, yet firm, free from clods, with enough loose soil on top to cover the beans to the depth of about 1 inch. Thorough and proper preparation of the soil will help to control weeds that otherwise will choke out the young plants and later seriously cut down seed production. Fertilizers may or may not be necessary, but inoculation is an essential requirement in the successful growing

of soybeans, especially if they are planted on lands on which they have not been grown previously. The victory gardener, growing a few beans on fertile soil, usually does not need to inoculate.

Since soybeans are not a native of this country, our soils do not contain their nitrogen-fixing bacteria; and it must be introduced by inoculation. Inoculation is also valuable for the yield and production of the crop. All legumes such as clovers, alfalfa, peas, beans, and soybeans utilize nitrogen of the air through the action of bacteria on the roots. The presence of the organisms is shown by the development of nodules on the roots. There are several kinds of nitrogen-fixing bacteria. Some are common in soils, and others have to be introduced. The bacteria of soybean nodules will not inoculate any other form of commonly cultivated legumes, nor will the bacteria found in other legumes inoculate soybeans.

The data in Table XXIV from the Illinois Agricultural Experiment Station *Bulletin* 310 show the value of inoculation.

Table XXIV.—Effect of Inoculation on Composition and Yield of Manchu Beans, University Farm, 1924

Hay	Tons	Per cent protein	Lb. protein per ton
Inoculated.....	2.53	15.81	316.2
Not inoculated.....	1.78	14.62	292.4
Gain for inoculation.....	0.75	1.19	23.8
Seed	Bushels	Per cent protein	Lb. protein per ton
Inoculated.....	46.6	35.25	705
Not inoculated.....	34.7	31.05	621
Gain for inoculation.....	11.9	4.20	84

Courtesy of John Deere, "Soy Beans for Profit."

At present, inoculation is being stressed as never before in the soybean belt. In wartime, farmers of America must produce every possible pound of food, and proper soybean inoculation will increase production to the equivalent of at least and possibly more than an additional four million acres. By inoculating every

pound of soybean seed, growers have consistently increased the yield from 1 to 10 bushels and more per acre. The expenditure of only a few cents per acre will ensure an abundance of nitrogen and will increase yields, increase the quantity of oil produced, and increase not only the quality but the percentage of protein in the soybean crop.

The time of seeding is very important and may extend from early spring to late midsummer, depending on the locality and use of crop. The tendency now among growers is to seed early for best yields, soon after corn planting, when the soil is warm and conditions are favorable for germination and rapid growth of the crop. Soybeans germinate and grow very slowly in a cold wet soil. They are a warm-weather plant and must be planted after all danger of frost. Too late planting, however, has been found to produce lower yields. Early fall frosts and severe droughts just when the beans are maturing cause great damage to the crop and are feared by every grower.

The method of seeding depends on convenience and economy of cultivation and harvesting, variety, type of soil, climatic conditions, and purpose of the crop. The development of machinery for soybean production has made a change in planting during the last years, and the trend is toward row cultivation. Row-seeded beans are easier to keep free from weeds. Other factors that favor planting soybeans in rows are higher yield of seed and hay, larger beans, fewer fallen plants at harvesttime, higher percentage of foliage, less lodging, and fewer chances of poor results with inexperienced growers. Drilling in close rows has some important advantages such as a fine quality of hay, which eliminates the need for special machinery and decreases the cost of production.

The width of rows has also changed with changes in machinery and is still in the stage of experimentation. In the early production days, rows were 30 to 36 inches apart. Today, with the use of different planters and cultivators, the rows may be as little as 18 inches apart, though many prefer them from 21 to 28 inches. Some growers have found that having the rows 28 inches apart is the most successful in large-scale farming. The beans should be cultivated thoroughly and often enough to keep weeds down. Thorough destruction of weeds in the seedbed before planting will perhaps do more to ensure a weed-free crop

than will later cultivation. When planted in rows, the beans should be cultivated several times when from 3 to 14 inches high and a last time just before blooming. It is interesting to note that, after the plants have attained some size and have quite a number of leaves, cultivation should be done only when the leaves are dry and the plant is wilted or tough. That means late cultivating after the dew has dried and before it falls again.

HARVESTING

Better machinery and better varieties have meant much to the farmer and have resulted in higher yields. At first growers were

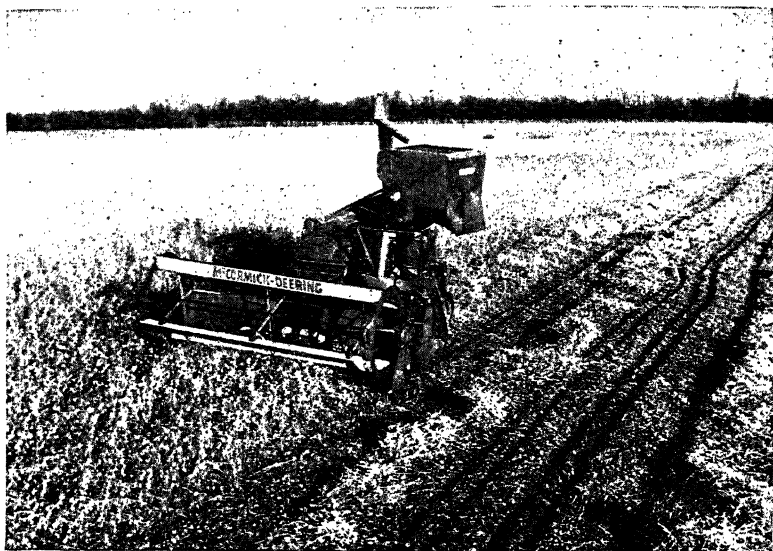


FIG. 9.—A self-propelled harvester-thresher (combine) at work in a crop of soybeans.

handicapped by a lack of tools and machinery for soy production; but, as soybeans became a recognized and important crop, such farm equipment came on the market and changed methods of seeding, cultivating, and harvesting. Often the same machinery can be used for both corn and soy. The International Harvester Company, for example, has a four-in-one farm implement that is a bean seeder, corn driller, soybean cultivator, and corn

cultivator. Experimental tests have been run through the cooperation of the agricultural engineering department of the University of Illinois and J. E. Johnson, president of the American Soybean Association. Equipment concerns often offer valuable information on various crops, and farmers can avail themselves of this free material. John Deere, of Moline, Ill., for example, publishes an excellent booklet entitled "Soybeans for Profit."

At first the harvesting of the beans presented a real problem. It was done at a very high cost by the binder-thresher method used for grains. The beans were cut, bound into bundles, set up in small shocks, and allowed to cure in the field before threshing. For any method of harvesting, the beans should always be cut before the pods begin to burst, because soybeans shatter easily and there is always a danger of loss by shattering in harvesting. Plant breeders have selected most of the commercial varieties for resistance to shattering, and the loss has been cut considerably. If the beans are too dry, harvesting early in the morning and late in the day when the plants are moist tends to reduce the loss.

The perfection of a combine for harvesting soybeans was a definite forward step in production. The combine did away with the binder-thresher method, cutting and threshing the beans in one operation that not only cut seed losses but cut harvesting costs almost in half.

The trend today, for the average farm, is toward the smaller combines that will cut two rows at a time and can be operated by one man. The small grower or gardener can cut, dry, and thresh his beans with whatever equipment is available. They can be threshed on an ordinary grain separator if it is specially adjusted, or pea or bean hullers may be used. Many a victory gardener will find that placing the dry beans in a sack and pounding them lightly shells out the bean satisfactorily.

The combine, however, brought up the problem of the right time to cut the beans for storage. After a detailed study, it was finally agreed that the only safe procedure was to test the beans for moisture. If the moisture falls below 14 per cent, preferably from 11 to 13 per cent, the beans are dry enough for safe storage. Many of the factors determining the grade of soybeans can be controlled by producers and operators of combines and threshers.

GRADING

Farmers cannot get top prices for dirty wool, small eggs, or orchard-run fruit, and the same is true of imperfect soybeans. In September, 1941, new Federal soybean standards became effective; and the beans are now graded as Number 1, Number 2, Number 3, Number 4, and as Sample. Sample grade is the lowest. Number 2 grade is used mostly in the grain business. A bean of this grade must have not more than 14 per cent moisture, not over 2 per cent of such foreign coarse material as sticks, stems, and large weed seeds, and not over 15 per cent of split beans; and it must test at least 54 pounds per bushel. Beans of different colors, such as black and brown in yellow varieties, lower the grade; and over 5 per cent of these beans in yellows throw the sample into the mixed class. These grade standards, however, have not proved of sufficient scope to represent the range of quality of soybeans produced in the United States. They have been found both unfair and confusing, as well as being too severe in the factor covering damage, especially if damage was due to frost. Necessary adjustments and modifications have had to be made to meet present conditions.

As improved varieties and machinery have lowered production costs, popular demand and commercial usage have raised soybean standards. Today this is true of the entire industry, whether raw beans or finished soy products. The soy industry mushroomed into a major cash crop and now is being refined by higher standards and rigid specifications.

Every grower wants to make money from soybeans and therefore will strive to harvest beans of high grade. The Extension Service of the U.S. Department of Agriculture, in a free pamphlet on the grading of the beans, stresses three factors for high grades:

1. Good seed.
2. Good seedbed.
3. Careful harvesting.

G. G. McIlroy, former president of the American Soybean Association, adds his suggestion of "alertness." He says, "The successful soy farmer must be on his toes at harvest time and must be nimble and quick to take advantage of opportunities offered." In other words, nature waits for no man; and, if the inexperienced grower does not take care of his beans when they are ready, he can expect failures and losses in harvesting.

Purdue University¹ lists this daily dozen for a successful crop:

1. Choose high-yielding, high-oil-producing, adapted varieties.
2. Use high-quality seed.
3. Plow early and drag immediately to start weeds growing.
4. Cultivate before seeding to kill weeds.
5. Inoculate unless two crops of well-nodulated plants have been grown on the field.
6. Seed just after corn is planted.
7. Plant shallow—about 1 inch deep.
8. Use 6 to 8 pecks per acre if seeding solid.
9. Use 3 to 4 pecks if in rows 20 to 30 inches apart.
10. On rich soils and droughty, sandy loams, row planting is preferred.
11. Cultivate early to break crust and kill weeds.
12. Use timely and efficient harvesting methods.

SOYBEAN DISEASES

Selecting the proper variety of seed is perhaps the farmer's first important problem, but he has two others of almost equal importance that he must not neglect. Up to now soybeans in the United States have been relatively free from diseases and pests. This is generally true of a crop in a new country; but, as time goes on, enemies multiply and new foes develop. We have already had a widespread attack of sclerotial or Southern blight in the South and root knot or nematode disease. There are also other diseases that are a constant menace to the crop and must be checked before they secure a firm foothold in this country. It is essential that effective control measures for the diseases be devised and that varieties of seeds resistant to the more important diseases be developed without delay. The U.S. Department of Agriculture realized this need and in May, 1943, gathered all their information into *Farmers' Bulletin* 1937, *Soybean Diseases and Their Control*. It is the work of Howard W. Johnson, of the U.S. Department of Agriculture, and Benjamin Koehler, of the Illinois Agricultural Experiment Station. It is a bulletin everyone interested in raising soybeans should own.

The Soybean Digest recently published an article on the study of soybean diseases, describing the program followed in 1943 to check them. Plant scientists in Ohio, Indiana, Iowa, Nebraska,

¹ *Vocational Educational Bulletin* 8, Agricultural Educational Series 6.

Kansas, Missouri, Wisconsin, Minnesota, and South Dakota will work in coordination with Illinois to learn about seed treatment for disease control. W. B. Allington has been employed as pathologist by the U.S. Regional Soybean Laboratory at Urbana, and he will work through the North Central states. The program for 1943 was threefold:

1. A survey to determine the kinds, relative prevalence, and apparent destructiveness of soybean disease in as large an area as possible.

2. A study of variety tests in different locations to determine varietal reactions to diseases.

3. Seed-treatment tests.

Just where the diseases came from no one knows. It is probable that a number of them came from Asia with the seed. Our job at present is to combat them in every way possible and to avoid serious future losses.

Soybean pests so far also have been few, but these too no doubt will change. The five main ones have been grasshoppers, blister beetles, leaf hoppers, green clover worm, velvet bean caterpillar. Some regions also report losses due to rabbits, especially during drought periods. As a rule, the soybean stands drought periods very well; but beans grown in arid regions are likely to mature unevenly, and there is then considerable loss by shattering.

CROP ROTATION

The farmer's third important problem is that of rotation of the beans. As yet they are a new crop, and we have therefore not fully learned about their long-time effect on the soil. Soybeans have a loosening effect on the soil; and, though this has frequently been a great asset, many farmers feel that the growing of soybeans has increased their erosion problems, especially on hilly land. Recent research seems to prove that soybeans have been overrated as an erosion cause, and the American Soybean Association feels that this may be overcome by proper tillage practices and by finding the beans a proper place in crop rotation.

DAMAGED BEANS

Both growers and processors are confronted with the problem of damaged beans, which result in severe losses and injury to the

entire industry. The problem was stressed at the War Conference of the American Soybean Association by Mr. Lamar Kishlar, chairman of the Soybean Nutritional Research Council.

In general, damaged soybeans fall into three classes:

The first is "green beans," caused by either early frost or severe drought at the time of maturity. Either of these arrests the development of the beans and causes the chlorophyll to remain in the seed. Soy oil made from such damaged beans is bright green in color and causes great trouble and expense to the refiner. The planting of early-maturing beans, especially in Northern areas, is the greatest check on this type of damage.

The second type of damage results when the beans are not harvested but are left in the field for part or all of the winter. This causes a different kind of impairment to both oil and oil meal. Oil from winter-damaged beans has a fixed red color that in most cases cannot be removed. The value of the meal from these water-soaked beans is also seriously impaired. Winter-damaged beans usually are full of sand and grit that resist the normal seed-cleaning methods of the elevator and oil mill.

The third type of damage is caused by improper storage on the farm, in the elevator, or in the crusher's storage bins. A high moisture content in the beans causes them to heat when stored in a tightly closed bin. Beans that have become hot have an oil and meal injury similar to that of winter-damaged beans.

Damaged beans result in four different kinds of losses:

1. A discount paid to the refiner because of an inferior quality of oil.
2. Loss because of the lower oil yield.
3. A lower feed value of the oil meal.
4. Higher crushing costs.

Soybeans in the past few years have often been the farmer's best cash crop, and all indications are that they will continue to be a profitable crop for years to come. Today, with all-out production, the farmer is faced with new problems. Always he has had to battle the forces of nature and to run the risk of cold, wet springs, severe droughts, and early frosts that curtail his crop. In addition, he now faces the problem of lack of labor and proper and sufficient machinery. Farming is always a vital industry. Food is ammunition for peace or war, and the farmer

must have his vital tools, labor, and machinery, and proper prices.

The farmer has done his job well in building a new industry for America. His job has been the actual growing of the beans; but before his successful production have come the men of agricultural science, the men who made new seeds and varieties possible, the men who scientifically have blazed the trail and marked the pitfalls. Behind the farmer are the men of industry and commerce, the processor, the chemist, the industrialist, the manufacturer, and the consumer. All have played their parts in the development of our wonder crop.

Chapter X

Tomorrow

THE versatile soybean will not be left out of the postwar picture. Its amazing adaptability will entrench it in the everyday life of America.

The value of soybeans in American agriculture was proved long before Pearl Harbor. Their use in the world conflict as a vital crop has made them more valuable than ever. The chances of postwar popularity for the soybean are excellent, but the road will not be easy. Soybeans will have to fight keen competition in postwar agriculture, industry, and nutrition. At present, the entire soy industry is geared for a vast wartime program. We cannot expect this entire machine to carry over to a peacetime era. There is bound to be a letdown, how much of a letdown no one knows; but we know for certain that the versatile soybean has great peacetime possibilities.

ACREAGE AND PRODUCTION

The soybean has changed American agriculture and will continue to change it. A few years ago, it was considered only an agricultural upstart; and those who were too enthusiastic over its merits as a crop were looked upon as fanatics. The same was true in the food field. In 1924, we raised less than 5 million bushels; in 1942, almost 200 million bushels. Soybeans made a peacetime jump in production from approximately 5 million to more than 106 million bushels in 17 years. This increased

SOY WILL CHANGE THE SHAPE OF MANY THINGS TO COME



FOODS

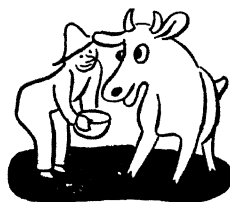
substitutes for:
butter, lard
meat
coffee
egg albumen
flour
cooking and salad oil
cereals
infant foods
bread, crackers
cocoa, chocolate
candy
ice-cream powder
ice-cream cones
vegetable milk
cheese
sausage products
green or dried beans
sandwich spreads
seasoning; sauces

toys
phonograph records
candles
fruit jar rings



CLOTHING

Substitutes for:
wool
cotton
leather
rubber
plastic accessories
waterproof garments
textile dyes
textile sizings



FARM

feed
fertilizer
insecticides
sprays
machinery
hay
soilage
ensilage



COSMETICS

soap
face cream
shaving cream
lipstick
nail polish
mascara



HOME

paint
varnish
fuel
roofing
linoleum
oil cloth
enamel
lacquer
wall paper
draperies
upholstery
kitchen utensils



INDUSTRY

lubricants
explosives
adhesives
electric insulation
printing ink
paper coating
laminated boarding
automobile parts
automobile accessories
paint
varnish
antioxidants
tubing
gaskets
gasoline stabilizers
fuel
synthetic rubber



MEDICINE

synthetic hormones
medicinal oils
health drinks
diabetic foods
vitamin concentrates
reducing foods

FIG. 10. (Courtesy of Look Magazine.)

production was made before the average individual became conscious of the bean, before he even knew what it looked like. It was made too before intensive research perfected various soy food products and before we dreamed of using soy as a national emergency food.

A few years ago, Henry Ford predicted that soybeans would surpass corn in the corn belt. War demands have made this prophecy come true. In the last year, the corn states have more than doubled their yield of soybeans, with almost the same increases in the Eastern seaboard states and vastly greater increases in the Southern states. We do not know how much more production will increase before the war is over.

Peacetime demands will again change the place of soy in our agriculture. Reduced acreage can and must be expected. The beans may disappear from regions where they have been raised only as a war crop, from hilly and rolling lands where it is believed that they tend to induce erosion, and from new regions where they have not proved so profitable a crop to the farmer as others he can raise.

Production will not go down at once. Domestic and world shortages of vegetable oil and protein foods and feeds will create a heavy immediate postwar demand for soybeans for at least two or three years, even five years, according to some authorities. With war restrictions removed, the beans can again assume their role in the industrial world, and it is safe to say that more will be used for this purpose after than before the war. Finally, the Second World War has given soy a real chance in the American diet. It will no longer be regarded as a fad or a diet food, but as an ordinary food that means much in our battle of nutrition. It must be remembered too that research on the uses of soy and the perfecting of beans and products for our tastes will continue and will probably create new demands.

All this does not mean, however, that production will hold its wartime level. Only an enthusiastic optimist would expect that. It does mean that soybean production need not slump back to that of prewar days—not as long as growers can produce at a profit. It means too that the soybean with its wealth of war-time experience is now equipped to do a real peacetime job. Its future in America is indeed bright and promising.

SOYBEANS ON THE FARM

Always soybeans will be valuable on the farm. They may be a hay and forage crop, a cover crop, or a soil improver; or they may take the form of an excellent protein feed for cattle, poultry, and even fur-bearing animals. Our greatest use of soybean meal has been for livestock feed, and this will continue to be true. The war has created a tremendous demand for protein feeds and has accented the superior quality of soy as a protein ingredient in feeds for the production of meat, milk, and eggs. As a result, thousands of farmers have used more protein feeds than ever before, and thousands have become acquainted with the soybean in this form. This condition cannot help but lead to a broadened use of soy feeds in the future. There is still room for vast expansion in this field, but the victory will not be won without effort. Increased use and demand for soy feeds does not mean that the bars of competition have been removed. The soy feeds will have to play their part in the keen postwar commercial war and prove their worth in competition with other protein feeds. The American Soybean Association and the feed manufacturers realize this fact and know too that increased uses of soy feeds in normal times are built on a steady and practical educational program for the farmer.

SOYBEANS IN NUTRITION

The soy industry has been built on two products—soy oil and soy meal. Both have made it a vital war crop, and both can make it a vital peace crop. Government food experts shudder to think what would have happened without these two products in the war feed and food programs.

We have become the largest consumers of animal and vegetable fats in the world; and the manufacture of industrial products from these oils is an outstanding domestic industry; yet these industries have been dependent on imported raw materials. Several years before the war, leaders in this field recognized the danger of national dependence on foreign fats and pleaded for the increase of domestic production of oil. An increase of at least two billion pounds per year was needed to make us safely self-sufficient and able to withstand a possible Pacific coast blockade. Today, domestic production of oil is being

pushed to the utmost to prevent a national calamity. The soybean bears much of this burden.

In the war program, soy oil is one of the urgently needed edible oils, almost nudging cottonseed oil for first place. Today soy oil enters the kitchen in both liquid and solid form. It goes to the armed forces, helps to fill a gap in world shortages, and through Lend-Lease is sent to our allies. Demands making soy oil vital in domestic production will continue through the war and for a few years to come. The return to normal world trade, however, will again bring keen competition among vegetable oils and between vegetable and animal fats. Soy oil will have to meet this competition. Its continuance as a major source of edible oil depends on many things, such as foreign trade regulations, our cotton production, and the cost of soy oil compared with other oils. It is safe to predict, however, that we shall use far more soy oil for edible purposes in the postwar period than we did before.

America for the first time is learning how to use soybeans as a food. We are not only beginning to realize their nutritional values but we are acquiring a taste for them; and the little beans will be a permanent fixture in our diet. Soybeans in time will perhaps be as common as navy and other beans. The high percentage of protein, vitamins, and minerals that made soybeans our best emergency and replacement crop will make them a valuable added element in our nutrition. Many foods will be fortified with soy for the betterment of humanity. The manufacture of soy flour will be one of our important industries. Consumption and uses of the flour will no doubt far exceed the dream of the pioneer.

Soy flour has proved an important factor in army and emergency rations. The same ideas will be carried out for a peacetime world in emergency kits and handy rations for the traveler, the camper, and the sportsman. Lend-Lease has used soy flour, grits, and flakes as a protein food; and vast quantities have gone to our allies and the starving nations of the war zone. Our foreign shipments of these products will not cease as soon as the war is over. It will take years to rebuild Europe and produce enough livestock so that meats will be the main source of protein. In the meantime, soy products are a vital, low-cost, and easily transported substitute.

Soy will always be an important item in the low-cost diet. When soy products such as flour and grits are made common and easily available, the low-cost diet will take a nutritional step upward. Such cheap foods as paste products, macaroni, spaghetti, cereals, and corn meal become far more nutritious when fortified with soy.

Soybeans made their debut in this country in the diet field, which is by no means exhausted. In fact, soy bids for even greater popularity and use in special and allergy diets. The value of soy milk and soy-milk powder is only now being recognized. There will also be great increases in the use of other soy products for dietary purposes. With lecithin, for instance, we have only scratched the surface. It presents an entirely new field in the challenge of nutrition—one that may even rival our now popular vitamins in value.

Green soybeans were just beginning to be used on the American table when soybeans went to war. The victory garden has given many persons all over the country firsthand experience with the beans. Green soybeans are destined to rival lima beans as a common and popular American vegetable. In the postwar grocery, they will be sold in canned and frozen form as well. Already canned green soys are found in up-to-date markets.

In the Second World War, the soy sprout has been taken out of the Chinese restaurant and market and placed on the American table. Nutritionally, it is one of our best ways to use the beans. From this standpoint, they should be one of our common vegetables. It is safe to say, however, that only a small amount will be used as a fresh vegetable in this country. The average American is not going to take the time to sprout the beans or to develop a taste for them. Their greatest advocates will be nutrition-minded individuals who are thoroughly convinced of the nutritional merits of the sprouts.

Nutrition was the last milestone for the soybean. Domestic shortages and world demands made it a vital field, a basic weapon in the war crisis. These values will of course carry over to the peacetime world. Soy, with its abundant amount of protein, vitamins, and minerals, will be one of our most valuable protective foods in restoring a malnourished world. Its importance in meeting immediate postwar needs cannot be overemphasized.

In the future, soy as a fortifying food will perhaps play a still more startling role.

POSTWAR INDUSTRIAL USES

If the future demand for edible soybeans looks promising, the industrial possibilities are even greater. Soy will play a part in the postwar changes and will no doubt touch every phase of postwar living in some way. Their amazing adaptability and possibilities in chemistry will give them a place as our best chemurgic crop. We must remember too that as yet soy meal and soy oil have had little opportunity to prove their value in the industrial world.

Postwar America will be a land of airplanes, plywood, plastics, synthetic rubber, and many new materials of all kinds developed to meet war emergencies. The plywood industry alone will consume vast quantities of soybean glue; soy protein will find its way into paint, paper, plastic, textile, and many other products for use at home, on the farm, and in industry. At present, our great problem is volume of production; after the war, it will be economy of production, which means keen competition. Naturally soy will lose out in some cases because of cost. Soy may not take the place of casein, for example, but research will undoubtedly develop uses for both casein and soy protein.

Soybean wool bids for popularity among the textiles. In normal years, the United States imports about one-half of the animal wool it uses annually. With production of raw material over a 10-year period averaging barely 362 million pounds and our consumption more than 515 million pounds, we must either continue to import large quantities of wool or seek substitute materials. We have not used as much wool as we might have, because of prohibitive prices; but, if the cost could be lowered, consumption would be doubled, perhaps even quadrupled. Vegetable wool such as soybean wool can no doubt be produced more cheaply than animal wool and will lower the cost of such woollen materials. It takes 2 acres of land used as grazing pasture for sheep to produce 8 to 10 pounds of wool a year, while 2 acres planted in soybeans will produce 400 pounds of protein suitable for fiber.

Should animal wool be preferred for clothing, soybean wool can still cut down imports, since it can be used for other purposes.

There is a possibility of mixing soybean and animal wools, thus stretching our supply. Soy wool can also be mixed with rayon.

Industrially, soybean oil has many possibilities. Intensive research on substitutes for foreign oils for paints is making it more valuable than ever. Indications are that the problem of a quick-drying oil for paints is being solved. If so, the future of soybean oil in the paint industry is indeed bright. The same is true of the entire industrial field.

Soybeans have been tested in the last few years and have not been found wanting. The future will perfect their unlimited versatility. We shall probably eat them, wear them, walk on them, and ride and sit on them without suspecting their presence.

FUTURE IMPROVEMENTS

The American soybean is still only a diamond in the rough. We have by no means exhausted its possibilities in the food or the industrial field, nor have we perfected the bean itself.

Soy varieties will be streamlined in the next few years; and improved strains will be developed for various localities, demands, and diseases. We can expect the new American soys to be better beans in every respect.

Our agricultural explorers, growers, and scientists will improve the beans to increase production in yield and oil content. The average yield in this country is approximately 18 to 20 bushels to the acre. Many growers, however, get 20 to 35 bushels per acre, and yields can be much higher. Indicating what can be done, the Illinois 10-acre Soybean Growing Contest in 1942 listed these winners:

First Place: Mr. Fred E. Phillips

Yield, 52.91 bu. per acre
Oil content, 21.93 %
Cost, \$258.71
Quality, 79 %

Total score, 85.86 %

Second Place: Mr. C. F. Davis

Yield, 46.57 bu. per acre
Oil content, 20.95 %
Cost, \$239.48
Quality, 100 %

Total score, 84.53 %

Third Place: Messrs. Frazier and Frazier

Yield, 48.59 bu. per acre
Oil content, 22 %
Cost, \$245.64
Quality, 75 %

Total score, 82.83 %

The average yield of all contestants for 1942 was 40.03 bushels per acre. This was an increase of $4\frac{1}{2}$ bushels per acre over the average yield of contestants' plots in 1941. Other state contests have indicated great increases.

Soy products have not reached their limit or perfection. The food industry of tomorrow will find many more uses for the little beans, many new and appetizing ways to slip them into our diet. Foods fortified with soy will play an astonishing role in our new science of nutrition.

Thus is the soybean being prepared for the day when peace shall return to a war-swept world, when plowshares will have priority over bombs and jeeps will be converted into tractors. Soy has given much in the last few years and will give much in the future. The power that has been geared for war we hope to turn for peace to the betterment of humanity. The postwar world will profit by the lessons we have learned. The humble soybean, prodigy of American agriculture, is playing a vital role in the drama of conflict and has the ability to star in the same role in the drama of peace.

Chapter XI

A Few Suggestions for Better Living

KITCHEN DIPLOMACY

Every woman no doubt feels at times that she is a K.P. (kitchen police). But, if she is not a K.D. (kitchen diplomat) most of the time, she is greatly handicapped. Ignorance is not bliss when it comes to eating, even if the average family seems to think so. That family has to be gently but firmly guided into better dietary channels, and the operation must be made as painless as possible. It is usually best if the dear ones are not aware that they are the victims of a carefully planned campaign.

We are realizing more and more that the cook holds the health of the family in her hands. It is, therefore, the duty of every mother, housekeeper, and cook to know the fundamental facts of nutrition and to apply these facts to maintaining her family's health whether they know it or not. The much used and abused saying, "You are what you eat," is a whole kernel of truth. Man's life depends on a ceaseless motion of chemical substances that feed, regulate, repair, build, and support his body, supplying him with what he needs in terms of energy and substance. What we call *nutrition* is the complicated combination of the processes by which living organisms receive and utilize the substances and materials necessary to maintain life.

One blessing that has come from our present catastrophe is the realization that diet, nutrition, and what we eat do make a difference, a great difference. Too often, however, the application does not take place until trouble has set in or even until it is too late. If we can eat to get well, *we can eat to stay well*. That is the lesson America has to learn.

Think what every young mother can do for her children: in her hands lies their health, not only for today, but for tomorrow, a foundation for life that money cannot buy.

Today, we are food-, vitamin-, and mineral-conscious. The government nutrition program, the rule of the seven basic foods, is beginning to bring results. Our slogan has become *eating for vitality*.

Industrial and defense plants are stressing the fact that *proper foods build vitality*. Workers are instructed to eat a good breakfast and to have a balanced lunch. The properly packed lunch pail has become an object lesson for women's clubs, utility concerns, and cooking schools. Magazines, newspapers, and advertising are spilling over with food information; vitamins, vitality, vim, and vigor ripple over the air waves.

Into this picture came the soybean—first, as a protein replacement food from the vegetable kingdom and now as a plus factor of better nutrition in its ability to provide extra protein, vitamins, and minerals to our diet. Soybeans are an excellent, inexpensive food, something we should know how to use. The host of soy products now on the market make the task both easy and interesting.

It is never easy, however, to change food habits or to introduce new foods. To the average American male, the soybean, or any bean for that matter, has little appeal; its wondrous protein content is overshadowed by his memory of a thick juicy steak. The chances are good that he is not the least bit interested in soybeans, does not even want to try them, and feels he can get along nicely without them. But such a rebelling male can get his beans without suspecting their presence.

Soybeans are dietary gems when it comes to versatility, even if the beans themselves lack glamour. If there is any doubt as to their table reception, such popular products as soy macaroni or soy crackers, bread, or toast should be tried first. Hot soy cinnamon toast is delicious. The fact that it is soy that is being

eaten can be casually mentioned after the skeptical family has asked for second or third pieces. Crisp homemade soy cookies will melt the resistance of any protesting family. If, however, the fact that they are soy has a bearing on digestive harmony, the soy ingredients can remain a kitchen-front secret.

Soy flour is a wonderful product, not only in food value but in its greater possibilities. It can fortify bread, rolls, muffins, cakes, cookies, pancakes, waffles, soups, and desserts without announcing its presence. In one instance, a man who had an old-fashioned aversion to soy and knew positively that he would not like it had been enjoying special waffles for several months. The day his wife accidentally ran out of soy flour he wondered what was the matter with the waffles she served that Sunday morning. It seems they had lost their special flavor!

Many mothers who are worried about vitamins and minerals make the mistake of placing soybeans or any food made with soy in a "good for you" category. Such a distinction does more harm than good. "Good for you" places anything in the diet class and makes its eating more or less compulsory. This might appeal to the diet- or food-minded individual, but it has the opposite effect on the person who loves food because it tastes good.

Everyone respects knowledge. If the mother of a family has a thorough knowledge of the nutritional value of soybeans and can tactfully insert a few potent facts at the right time in the family discussion, it usually carries weight. And if the father of a family can be led to discover a few of the reasons why he should eat soy, in any form, he will soon arrive at the conclusion that it is worth trying.

There is no reason why we should have to sneak up on soybeans, so to speak. Properly prepared, they are a delicious food. The green beans are a keen rival of lima beans; and baked soybeans, once the family has tried them, are often preferred to other baked beans. Today's soy foods are interesting and intriguing, and the cook has her choice of a hundred and one ways of serving them. New soy products are appearing all the time. Many of them need an identification tag to associate them with the original bean.

Soybeans present no problem to the clever cook who is willing to try new products, follows a good recipe, makes use of her

imagination, and seasons to please the taste of her family. Soybeans are not merely a fad or a diet food or a health food. They are extraordinary beans and should be considered as such. They are our number one protein food from the vegetable kingdom and we are just discovering their great value in our diet.

PERSONAL OPINIONS

For years, I have enjoyed the distinction of being classed as a "bit queer," a food crank, because I was interested in soybeans as a human food. I did not seek the beans; they were thrust upon me. But after I had started working with them, I found them a fascinating hobby.

It is safe to say, in the light of modern nutritional knowledge, that practically all disease is due in some measure to lowered resistance and enervation caused by wrong nutrition. It is equally safe to say that restoration can be greatly helped through the right foods, vital foods, balanced foods, and building foods. Somehow, up to now, we have shunned the word *diet*. Being on a diet was something to keep as secret as possible, but often it was what we were forced to turn to as a last resort in order to regain health.

I know. I have learned the hard way, in the school of experience. Several years ago, I learned what the right diet and the right kind of food can do for the human body. Or rather I learned what Nature can do if she is given a chance to function properly. The result was that nutrition became my chief interest. I believe, however, that the word *nutrition* is too limiting. It is only one side of the triangle. Man must be fed mentally and spiritually as well as physically. I therefore prefer the general term *better living*. It is broad enough to include proper nutrition, which is, after all, only *common-sense* living.

America needs a good dose of common sense when it comes to living. The average individual is more concerned about the condition of his car, how it runs, and the gas and oil that he buys for it than about the condition of his own body or the food he buys for it. He is likely to blame fate or grandmother for his liver trouble, his rebelling stomach, and his jittery nerves. He does not blame fate, however, when he runs out of gas or burns out a bearing of his car. He knows that this is due to his own carelessness. He refuses to admit that the same is true of the

human body. Given proper care, the body is more like the one-hoss shay; we wear out all at once and nothing first.

Common-sense living does not mean that we have to become an oddity of society, with bare feet, long hair, and flowing robes; or a nudist; or a raw-foodist, nibbling on greens and raw fruit or even using the obliging soybean in place of animal proteins. Not at all. Common-sense living is striking the happy medium, working *with* Nature and not against her.

The average individual in all probability thinks that common-sense living is too simple, too old-fashioned, and too slow. He is prone to forget that an ounce of prevention is worth more than a pound of cure or that too often the cure cannot be bought at all with any kind of money. Health does not come out of a bottle. It is not in a pill or a tablet. It is the observance of the laws of Nature, giving her what she needs to function properly, be it food, drink, rest, sleep, or relaxation.

We are getting deeper and deeper into the *synthetic* age, and its results are showing in our bodies. We are the victims of the modern age, of artificial foods with the vital elements lacking. It is no wonder that we have become food-minded, that we have turned to diet, to nutrition, and to vitamins and minerals to find a solution to our ills.

The last dozen and a half years of my work have given me a wonderful opportunity to observe the dieting public. I have become tolerant of all phases of the healing art. I marvel at the wondrous achievements of medical science, at the magic of Nature when given the least bit of cooperation. I have become aware of the intricate workings of the human body, its idiosyncrasies and the wonders of the natural processes that science cannot equal. I am more convinced than ever that test-tube products, even if they represent the ultramodern, are still inferior to what Nature has supplied. We can streamline everything else, but we cannot streamline the human body. We are still operating on the same physical plan that was given Adam in the garden of Eden.

Modern nutritional knowledge has made us aware of hidden hungers, of missing vitamins and minerals, of trace elements and of unknown factors all to be found in natural foods. I have had the opportunity to see what they can do to the human body when applied in the common-sense regime, even in a corrective diet

that is denounced as extreme. That is why I have become tolerant of dietary theories that may seem revolutionary, knowing that the excellent will remain and the ridiculous and worthless will eventually be discarded.

I have marveled often at the results of the vegetarian diet, the raw-food diet, and the diets of those whom we call fanatic. I have seen the value of the soybean in these diets and how it has come through with flying colors. It convinced me long ago that soybeans were a wonderful food that belonged in our diet. We did not understand their value or how to use them.

I have worked with doctors, nutritionists, and dietitians who wanted to experiment with soy or who wanted soy products for their patients. Sometimes securing the products was not an easy task. When I did get them, I had to make up recipes. To be sure, I must admit that many of these concoctions eventually found their way down the kitchen drain. I used the beans imported from Manchuria and did not know how to cook them. The first soy flour was gritty; the hulls had not been removed; it was bitter and beany in taste. Bakers experimented with soy bread, and no two batches turned out the same. Canned soy milk was an unheard-of product. When it did appear, it was far from perfect. Nevertheless, milk-allergy babies thrived on it. In those early days, the person who ate soy did so because his diet required it or because he was convinced of its merits. Every soy pioneer can tell the same story, be he plant scientist, grower, processor, food manufacturer, or even consumer; we were all lumped into the same class, "fanatics." We who were interested in soy as a food wore the extra designation of "food nuts."

• It has been interesting to watch the rise and struggle of the soybean—to see it grow from a struggling, misunderstood import to a major cash crop and now a vital food crop. I am sure that every pioneer smiles with satisfaction at the way soy is meeting a world crisis and is tempted to say, "I told you so!"

Soybeans are the new food for America. They are here and here to stay. Our big problem now is education. We must learn how to use this ancient food with a modern touch.

SOYBEANS FOR EVERYONE

The following recipes introduce the soybean as an appetizer, an entree, or a tidbit. Many of these recipes are simple, prepared

with a thought for better digestion. My criticism of many dishes is that they are a concoction of everything imaginable, of anything the cook happens to have, and that they are prepared in such a manner as to make them more or less a gastronomical error. Perhaps I am too cautious, too digestion-conscious; but my work with the corrective diet has convinced me of the value of simple foods and simple cooking.

I have tried to include here every type of recipe for every purpose or taste. There are recipes with a lot of soy and recipes with little soy. Doctors and dietitians are often more interested in the food value than in taste and appearance. Some have requested recipes containing all soy. There are several recipes suitable for milk-, wheat-, and egg-allergy diets. I have purposely avoided heavy condiments and rich and spicy trimmings. They can always be added if the taste requires them. The secret of a clever cook is her ability to juggle a recipe to suit her purse, her fancy, and her family. I prefer baking and broiling to frying and the use of whole-wheat flour and other whole-grain products.

There is nothing difficult about cooking soybeans, just remembering that they require *long cooking and extra seasoning*. The addition of a meatlike flavor adds to their favor. This may be accomplished with meat stock, soy sauce, or the various meatlike flavorings used by the vegetarian. These flavorings can be purchased in paste, liquid, or dry form. They are sold in all food-specialty shops and health-food stores. The new brewer's yeast with beefsteak flavor can also be used as a seasoning and adds extra vitamin B as well.

I am partial to the use of powdered vegetable broth or the mixed powdered vegetable as a seasoning. They can be secured with or without onion and add a delightful flavor to soups, salads, dressings, sauces, meat, fish, meat substitutes, and casserole dishes. The person who is forbidden the usual seasonings will find such a product welcome.

I hope by now that I have convinced you of the nutritional merits of the *staff of life of China* and that I have aroused your curiosity sufficiently to tempt you to try the beans in some form or other. Here you have your choice—from soup to nuts.

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Recipes

GREEN SOYBEANS

Green soybeans are a most palatable and nutritious vegetable with a pleasant firm texture and nutty flavor. Their 6 per cent available carbohydrate places them in the low-starch class of vegetables. Green soybeans can be cooked and used like green lima beans or peas and because of their protein content are a welcome addition to less nutritious foods.

BUTTERED GREEN SOYBEANS

Remove beans from pods. To make hulling easier, pour boiling water over pods and let stand 3 to 5 minutes. Drain, break pods crosswise, and squeeze out the beans. Cook as you would green peas or lima beans. Add a small amount of boiling water to the beans, salt, cover, and cook until done. Time varies with the variety of the bean. Some cook in 15 minutes; others take 30 minutes or more. Avoid overcooking. Cooked green soybeans will have a firm texture and will not become mushy, as peas or lima beans do, after long cooking. Drain, season with butter, and serve.

STEAMED GREEN SOYBEANS

Steam beans until tender, using no water whatsoever. When done, add butter and desired seasoning.

CANNED GREEN SOYBEANS

Canned green soybeans are sold in many large markets and in all specialty-food shops. They may be served as a low-starch vegetable and are delicious hot or cold. Use as plain buttered beans, or for soups, salads, and meat-substitute dishes.

GREEN BEANS COOKED IN PODS

Green soybeans are sometimes cooked and served in the pods. They are eaten with the fingers after being dipped in melted butter seasoned with soy sauce. The pods need thorough washing to free them from grit that may lodge in the fuzzy surface. After washing, drop the pods into boiling water. Cover and cook until the beans are tender; then slip them out by pressing the pods between thumb and finger.

QUICK CORN CHOWDER

6 slices bacon	2 cups cooked or canned green
2 cups cream-style canned corn	soybeans
	Seasoning as desired

Cut bacon into small pieces and cook until crisp. Drain off most of the melted fat. Add corn and soybeans, cook 2 or 3 minutes. Minced green peppers or onions may be added if desired, and they may be cooked with the bacon. This makes a quick, easy, and delicious dish for an outdoor meal.

FRESH SUCCOTASH

2 cups shelled green soybeans	2 tbs. butter
2 cups fresh corn kernels	$\frac{1}{2}$ cup cream
1 cup of cold water	Salt and other seasoning as desired

Place beans in pan and add 1 cup cold water. Boil until beans are almost done. Then add corn kernels that have been cut from cob with a sharp knife. Cook 5 to 10 minutes. Season with salt to taste, butter, and add cream. Serve hot. Green peppers may also be added to vary this dish.

CHILE CON CARNE

1 cup peeled, finely sliced onions	2 tbs. chili powder
4 tbs. diced green pepper	$\frac{1}{4}$ cup cold water
3 tbs. fat or oil	1 tsp. salt
2 lb. rump steak cut into $\frac{1}{2}$ -in. cubes	2 tsp. brown sugar
	3 peeled garlic cloves minced
3 cups boiling water	1 large can green soybeans
1 cup tomato juice	

In a heavy skillet, cook the onion and pepper in the fat until tender. Add cubed meat and cook uncovered until brown. Add boiling water, tomato juice, chili powder that has been mixed with the $\frac{1}{4}$ cup of cold water, salt, sugar, and minced garlic. Cover and cook slowly for $1\frac{1}{2}$ hours or until meat is done. Add more hot water if mixture thickens before meat is done. Add green soybeans and heat. Taste and add more seasoning and chili powder if desired. Canned dry soybeans may be used in place of green.

SCALLOPPED GREEN SOYBEANS

Cooked green soybeans

Melba toast crumbs

White sauce

Fill baking dish with cooked green soybeans. Add white sauce to almost cover. Top with crumbs and bake in moderate oven 20 minutes.

Variations. Use equal parts of cooked soybeans and cooked carrots.

Use equal parts of cooked soybeans and cooked celery.

Add a small amount of minced ham or bacon for flavor.

BAKED GREEN SOYBEANS AND BACON

6 slices bacon

Pepper if desired

4 cups cooked or canned green
soybeans

cups thin white sauce

2 tsp. minced onion

$\frac{1}{2}$ tsp. salt

$\frac{1}{2}$ cup Melba toast crumbs

Cook the bacon in a skillet until crisp. Cut into small pieces. Add bacon to the green beans, together with 1 tbs. of the bacon fat, salt, cream sauce, and onion. Pour into greased casserole, top with Melba toast crumbs. Bake in a 400° oven 30 minutes. If desired, bacon fat may be used for the cream sauce instead of butter. To make sauce, use 2 tbs. fat, 2 tbs. whole-wheat flour, $1\frac{1}{2}$ cups milk. Blend flour with fat, add milk, and cook until smooth.

GREEN SOY FRITTERS

2 cups cooked or canned green
soybeans

2 eggs

Salt as desired

2 tsp. powdered vegetable broth

Mash green beans well and add to beaten eggs. Add vegetable broth and season with a small amount of salt. Bake as fritters on a hot, heavy, slightly greased pan. Allow to brown on one side and then turn. Delicious if cooked in bacon fat. Serve hot with tomato sauce or gravy.

COMBINATION SALAD BOWL*

- | | |
|--|-----------------|
| 2 cups or 1 can drained green soybeans | Asparagus tips |
| 1 cup chopped celery | Romaine lettuce |
| 1 cup shredded carrots | Water cress |
| | Tomatoes |

Mix soybeans, celery, carrots, and desired amount of shredded romaine lettuce, water cress, and sliced tomatoes. Moisten with French or sour-cream dressing. Fill shallow salad bowl, top with asparagus tips, sprigs of water cress, and sliced tomatoes.

GREEN SOY AND CUCUMBER SALAD

- | | |
|--|--------------------------------|
| 2 cups or 1 can drained green soybeans | Mayonnaise or desired dressing |
| 2 cups diced cucumber | Leaf lettuce |
| 1 cup shredded carrots | Sliced tomatoes |

Mix drained soybeans, cucumber, and carrots. Add dressing. Mix well and serve from lettuce-lined bowl or platter. Decorate with sliced tomatoes.

SOYBEAN VEGETABLE SALAD

Canned or cooked green soybeans may be mixed with any raw or cooked vegetable such as carrots, celery, cauliflower, beets, peas, cabbage, cucumber, or tomatoes. Season with French, cooked, or sour-cream dressing or mayonnaise. Decorate with ripe olives, radish roses, or water cress.

MOLDED GREEN SOY SALAD

- | | |
|--|-----------------------------------|
| 1 pkg. lemon- or lime-flavored gelatin | 1 cup chopped celery |
| 1 pt. water | 1 cup finely shredded raw carrots |
| 1 cup cooked or canned green soybeans | |

* For other salad recipes, see p. 230.

Dissolve gelatin and cool until partly thickened. Add mixed vegetables. Pour into large shallow pan or individual molds. Chill until firm. Serve on lettuce with desired dressing. Green peppers may be added if desired.

SOY APPLE SALAD

$\frac{1}{2}$ cup raisins	$\frac{1}{2}$ cup chopped celery
1 cup chopped apples	$\frac{1}{2}$ cup finely grated carrots
1 cup cooked green soybeans	Mayonnaise or cooked dressing

Mix all together, chill, and serve on crisp lettuce.

DRY SOYBEANS

Helpful Suggestions. Soybeans require long cooking. Always soak overnight before cooking. Soybeans require some kind of extra seasoning in the form of bacon, ham, soy sauce, meatlike seasonings, pimiento, or tomatoes. Soaked, 1 cup dry beans will make $2\frac{1}{2}$ to 3 cups. 1 tsp. of salt is about right for each cup of dry beans. Soy sauce and meatlike flavorings are salty. If they are used, it is wise to cut the amount of salt almost in half.

General Directions for Cooking Dry Soybeans. Look over beans, removing all foreign particles. Wash well. Place in bowl and cover with water. Soak overnight or for several hours.

Pressure Cooking. Pour beans, with water used for soaking, into pressure cooker. Add salt and meatlike seasoning, cover, and cook for 30 to 45 minutes.

Top-of-stove Cooking. Place well-soaked beans in heavy pan. Add salt and seasoning. Almost cover with water. Cook for several hours or until beans are tender, adding water as needed.

Baking Soybeans. Place well-soaked beans in heavy pan. Add salt. Cook 2 or 3 hours. Remove from pan, place in baking dish, and add seasoning and enough liquid to cover. Cover and bake in moderate oven for several hours or until beans are done. Remove cover during the last half hour of baking.

COOKED DRY SOYBEANS

1 cup dry soybeans	1 heaping tsp. powdered vegetable broth or 3 tbs. minced celery
Water	
$\frac{1}{2}$ tsp. salt	1 tsp. meatlike flavoring paste or 1 tbs. meatlike sauce or soy sauce

Wash beans and soak overnight in 3 cups cold water. Cook in same water, adding more if necessary to make 1 cup water. Pour beans and water into pressure cooker, adding salt, powdered vegetable broth, or minced celery and meatlike flavoring. Cook about 45 minutes. Add more salt or meatlike flavoring if necessary. If gravy is desired, add $\frac{1}{2}$ cup more water before cooking. When done, drain off liquid and thicken it with 1 tbs. whole-wheat flour. Add beans and reheat. If using ordinary pan, not pressure cooker, cook beans several hours, adding more water as needed.

COOKED SOYBEANS WITH TOMATO SAUCE

Wash and soak beans as for above recipe. In the morning drain and add

1 cup tomato juice
 $\frac{1}{2}$ tsp. salt

1 heaping tsp. powdered vegetable broth
1 tbs. soy or meatlike sauce

Cook beans in pressure cooker 45 minutes. Tomato sauce or soup may be used instead of juice, and other seasonings may be added to taste.

COOKED SOYBEANS WITH ONIONS AND CELERY

1 cup dry soybeans
1 cup chopped celery

1 medium-sized onion sliced

$\frac{3}{4}$ tsp. salt

1 tsp. powdered vegetable broth

1 tbs. soy sauce

Wash and soak beans overnight. In the morning add 1 cup water, salt, and cook in pressure cooker until $\frac{3}{4}$ done. Then add chopped celery, sliced onions, broth, and soy sauce. Continue cooking until done. Drain off liquid and thicken with a small amount of whole-wheat flour. Add beans and heat before serving. For tomato flavor, use tomato juice or pulp instead of water in cooking beans. If using ordinary pan, cook beans until almost done before adding celery and onions. Onions may be omitted, and more celery used instead. A few minced ripe olives may be added if desired.

BAKED SOYBEANS I

- | | |
|---|----------------------|
| 2 cups dry soybeans | 2 tbs. molasses |
| 2 tsp. salt | 4 slices bacon diced |
| 1 tbs. powdered vegetable broth | |
| or $\frac{1}{4}$ cup finely minced celery | |

Wash and soak beans overnight. Add salt and cook until almost done. Drain. Mix beans and diced bacon in casserole or bean jar. Put broth and molasses in measuring cup and fill with water from the beans. Pour mixture over beans, adding more water to almost cover. Cover and bake 2 to 3 hours. For only 2 or 3 persons, cut recipe in half.

BAKED SOYBEANS II

- | | |
|---------------------------------|------------------------------|
| 2 cups dry soybeans | 2 tbs. soy or meatlike sauce |
| 1 tsp. salt | Tomato juice |
| 1 tbs. powdered vegetable broth | Bacon |
| 4 tbs. finely minced celery | |

Wash and soak beans overnight. Add salt and cook until almost done. Drain. Pour beans in casserole or bean jar and mix with vegetable broth and minced celery. Add tomato juice to almost cover and bake covered in a slow oven for several hours. For the last hour, remove the cover, top with 2 or 3 slices of bacon, and bake until crisp.

BAKED SOYBEANS III

- | | |
|--------------------------------|--------------------------------|
| 2 cups dry soybeans | 1 tsp. minced onion (optional) |
| $\frac{1}{4}$ lb. salt pork | 2 tbs. molasses |
| 2 tsp. salt | Boiling water |
| $\frac{1}{2}$ tsp. dry mustard | |

Wash and soak beans overnight or longer. Add water and salt and cook until almost tender. Drain. Place in casserole or bean jar and add cubed salt pork, burying it in the beans. Mix mustard, molasses, and onion in measuring cup and fill with water from the beans. Pour mixture over beans. Add more water, if necessary, to almost cover. Cover and bake several hours in a slow oven. Remove cover during the last hour to allow pork to become crisp.

BAKED SOYBEANS IV

8 cups cooked dry soybeans	4 tbs. flour
(about 1 lb.)	2 cups tomato juice
$\frac{3}{4}$ tsp. dry mustard	1 lb. salt pork
$\frac{1}{2}$ cup brown sugar	

Wash and soak dry soybeans overnight. Boil gently 2 hours in same water, adding 1 tbs. salt. Place one-half of the beans in greased baking dish, add half of pork cut into small pieces, add remaining beans, and top with remaining pork. Add mixture of mustard, sugar, flour, and tomato juice. Bake 3 hours at 350°. The liquid from the boiled beans may be added from time to time if more moisture is desired. Baking for 1 hour the second day improves the flavor.

Mrs. J. A. Cartter. Courtesy of *Soybean Digest*.

BAKED SOYBEANS AND ONIONS

1 lb. dry soybeans	2 tbs. butter
1 large onion sliced	2 tbs. soy or meatlike sauce
2 tsp. salt	2 cups tomato juice

Wash and soak beans in 6 cups of water overnight. Add salt and cook until done. Slice onion and brown in butter. Add soy or meatlike sauce and tomato juice. Cook a few minutes. Place drained beans in casserole, add tomato sauce, top with 2 or 3 slices of bacon and bake uncovered in slow oven 1 hour or more.

CANNED OR BAKED SOYBEANS

Canned or baked soybeans are now available in most markets, either plain or in tomato sauce. They may be served like any baked beans and are good hot or cold. The plain beans are more flavorful when heated with tomatoes, bacon, or various sauces.

SOY CHILE CON CARNE

2 cups cooked soybeans	$\frac{1}{2}$ lb. lean ground beef
$\frac{1}{4}$ lb. diced salt pork	2 cups tomatoes
$\frac{1}{4}$ cup chopped onions	1 tbs. chili powder

Fry diced salt pork until crisp. Remove the pork and add the onions. Cook until brown. Add ground beef. Stir well, cover, and cook 10 minutes. Add the crisp pork, beans, tomatoes, canned or fresh, and chili powder. Bring to boiling point.

MEATLESS SOY CHILE CON CARNE

Follow above recipe, using 4 tbs. margarine or oil in place of salt pork, $\frac{1}{2}$ cup onions, and 1 medium can of meat substitute diced in place of lean beef. Add desired meatlike flavoring.

SPROUTED SOYBEANS

The Second World War has brought sprouted soybeans into the limelight. They are the field or garden beans with a 2- or 3- in. sprout, containing all their nutritious food value plus the vitamin C developed in sprouting. Some authorities regard them as our best edible form of soybeans (see Chap. V, page 80). Sprouted soybeans make an excellent meat substitute and a delicious salad vegetable. They may be eaten cooked or raw. The sprouts require only a few minutes' cooking. They are valuable as a raw salad vegetable when other salad greens are not available, and the dry beans may be sprouted as needed. Soy sprouts are now sold in many markets, but they may easily be sprouted at home. All that is necessary is a covered container with good drainage, in which the beans can be flooded with lukewarm water several times a day. Beans placed uncovered in a small amount of water to sprout turn brown and rot before the sprouts are formed. The following directions for sprouting are from the U.S. Department of Agriculture and the School of Nutrition, Cornell University:

METHODS FOR SPROUTING SOYBEANS

Department of Agriculture Method.

Soy beans, like mung beans, can be sprouted in a flowerpot, a sink strainer, or any container that has holes in it for drainage and can be covered. Be sure the container is large enough, for the beans swell to at least six times their original bulk as they sprout. Soak overnight, and next morning put the beans in the container, cover, and leave them in a warm place. Flood with lukewarm water at least four or five times each day during the sprouting period. In 4 to 6 days the sprouts will be 2 to 3 in. long. Then they should be kept in a cool place, just like any fresh vegetable.

Bean sprouts are a good addition to raw salads or to omelet, soufflé, meat stew, or fricassée. The sprouts are very tender and to hold their crispness should not be added to hot mixtures until a few minutes before serving. They are also often used with soybean curd and vegetables in chop suey.

U.S. Department of Agriculture, *Bulletin* 166.

Dr. C. M. McCay, of the School of Nutrition at Cornell University, and the New York State Emergency Food Commission have done much to popularize the soy sprouts.

Their directions for growing them follow. They suggest securing a bean that will sprout quickly and using a little chlorinated lime to prevent mold. Beans older than 1 year will not sprout well. Beans are less likely to mold if sufficient air is allowed for proper ventilation.

McCay Step-by-step Process for Sprouting.

1. Sort beans, removing broken pieces and other seeds.
2. Wash beans.
3. Soak beans overnight in lukewarm water to cover. To 1 lb. beans use 3 pt. water and add a pinch of chlorinated lime. For 20 lb. of beans use 30 qt. of water and add 3 tsp. chlorinated lime mixed to a paste with a little water.

4. Drain beans next morning and pour into sprouting vessel big enough to let them swell three to four times. If a clean flowerpot is used, put a piece of wire netting or cloth across the hole in the bottom. For a milk bottle or fruit jar, cover the opening with a piece of wire screen or cloth, wiring it on after the beans are in the bottle.

5. Keep beans dark and moist. Cover the beans in the flowerpot with a damp cloth. This may then be covered with a piece of damp cardboard to exclude light. If the beans are placed in a wet cloth bag, they should be suspended in a dark, damp place such as a covered pan with a little water in the bottom. But they should not touch the water. If the beans are not dark, they will turn a yellowish green.

6. Water several times daily. The bottom of the flowerpot should be raised or tipped slightly so that all water drains out after each watering. Simply fill the jar or bottle with water, turning it upside down for the remainder of the time so that the water will drain out and the beans will have air. Each evening it is wise to add a pinch of chlorinated lime to the sprinkling water.

Twenty pounds of beans may be sprouted in this same way. For watering, a spray nozzle on the garden hose may be used; or, even better, the head of a sprinkling can may be wired to the garden hose. The top

of the sprouter should be covered with a damp cloth and the beans kept dark. At the last wetting each night, the chlorinated lime, made into a paste, should be mixed in the water that is used for sprinkling. This will prevent the growth of molds and bacteria during the night just as it sterilizes drinking water.

After the second day, the sprouting process makes the large quantity of beans warm and they should be sprinkled with cool water. For additional cooling, a cylinder of wire netting can be placed in the center of the can like a piece of stovepipe. During the last 2 days, a chunk of ice can be placed on the beans.

The beans are ready to eat from the third to fifth day, but in summer only 2 days may be needed for sprouting.

Sprouted beans should be kept refrigerated like fresh meat. For longer keeping, they may be blanched for 2 or 3 minutes and then either frozen or dried.

Suggestions for Using Sprouted Soybeans. Use the sprout with bean attached. The beans are chewy but crisp and should not be overcooked. Usual cooking time is only long enough to remove the raw-bean flavor. Many persons prefer to eat them raw.

The beans may be sautéed and served as a plain vegetable. To sauté, place a small amount of fat in a pan, add sprouts and a small amount of water, cover, and cook 10 to 15 minutes. Some persons prefer only 5 to 8 minutes' cooking. Minced onion browned in the fat gives a good flavor as does a small amount of soy sauce.

The beans may be steamed or cooked a few minutes in water and then buttered or browned in a small amount of fat.

Cooked sprouts can be added to any vegetable combination for casserole dishes, soups, and stews. They are excellent for chop suey dishes. They may be added to salads and to scrambled eggs and omelets.

COOKED BEAN SPROUTS

1 lb. fresh bean sprouts
2 tbs. butter

1 tsp. powdered vegetable broth
Soy sauce

Cook fresh bean sprouts in a small amount of water for 3 to 10 minutes. Melt butter in heavy pan. Add bean sprouts. Season with powdered vegetable broth and a small amount of soy sauce. Stir until well blended and serve at once.

BEAN SPROUTS AND BACON

 $\frac{1}{4}$ lb. bacon

Soy sauce

2 cups cooked bean sprouts

Cut bacon into strips and fry until crisp. Add cooked bean sprouts and a small amount of soy sauce. Blend well and cook a few minutes.

STEWED SPROUTS AND TOMATOES

2 cups cooked bean sprouts

1 cup stewed tomatoes

Mix and bring to boil. Add a small amount of butter or margarine, sprinkle with minced parsley, and serve at once.

FRIED SPROUTS

1. Fry sprouts in a heavy pan with a small amount of fat until brown. Stir to prevent burning. Add fat as needed. Sprouts should be crisp and brown in 10 minutes.

2. Brown sprouts in fat for 5 minutes, then add a small amount of water, cover, and cook on low flame for 15 minutes.

3. Brown sprouts and minced onion in fat, add a small amount of water, season with soy sauce, cover and cook on low flame until tender.

4. Steam or cook sprouts in water 10 to 15 minutes. Then sauté a few minutes in hot fat. Onions and soy sauce may be added to flavor.

BEAN-SPROUT SOUP

4 cups clear soup, vegetable
broth, or stock2 cups soybean sprouts
2 beaten eggs

To clear soup, vegetable broth, or stock, add soybean sprouts. Boil 8 to 10 minutes. Remove from fire and stir in beaten eggs. Season to taste with salt and vegetable seasoning. Soy sauce may be added if desired.

SPROUTS FOR SALAD*

Soy sprouts may be used raw for salads if there is no objection to the raw-bean flavor. Beans may be cooked 10 minutes and then chilled or cooked only 5 minutes, chilled, and mixed with raw and cooked vegetables.

* For other salad recipes, see p. 230.

SPROUTS COLE SLAW

Make cole slaw according to favorite recipe. Add 1 cup soy sprouts.

SPROUT COMBINATION SALAD

- | | |
|----------------------------------|--------------------------------------|
| 1 cup slightly cooked sprouts | 1 diced cucumber |
| $\frac{1}{2}$ cup chopped celery | $\frac{1}{2}$ cup diced green pepper |
| 4 radishes sliced | 1 cup shredded lettuce |

Mix all together. Chill. Serve on lettuce, topped with green pepper ring and French dressing.

TOSSED SALAD*.

- | | |
|------------------------|-------------------|
| 1 cup shredded lettuce | 1 cup soy sprouts |
| 1 cup grated carrot | 3 tomatoes cubed |
| 1 cup chopped celery | Water cress |

Toss all together, moisten with French dressing or oil, and serve from salad bowl.

BEAN-SPROUT SALAD*

- | | |
|---|---------------------------------------|
| 2 cups sprouted beans, steamed
and chilled | 2 tbs. vinegar |
| $1\frac{1}{2}$ tsp. salt | 1 head of lettuce |
| $\frac{1}{8}$ tsp. pepper | 1 large green pepper, chopped |
| $\frac{1}{4}$ cup salad oil | $\frac{1}{2}$ cup onion, chopped fine |

Steam or boil sprouted beans 5 minutes. Skim off husks that rise to surface. Drain and chill. Make dressing by mixing salt, pepper, salad oil, vinegar, and small amount of minced onion. Chill. Rub salad bowl with garlic if desired. Toss shredded lettuce, bean sprouts, chopped pepper, and onion together in the salad bowl. Just before serving, add dressing.

BEAN-SPROUT CHOP SUEY

- | | |
|--------------------------------------|---------------------------------|
| 1 cup lean beef | 1 tbs. molasses |
| 1 cup chopped celery | 2 tbs. soy sauce |
| 1 small onion | Salt |
| $\frac{1}{2}$ lb. fresh bean sprouts | 1 tsp. powdered vegetable broth |

* N. Y. State Emergency Food Commission Nutrition Service.

Cut beef into small pieces. Fry in oil or butter until brown. Add celery, onions, and bean sprouts, salt, powdered vegetable broth, and soy sauce. Add $\frac{1}{2}$ cup water or soup stock. Mix. Cover and cook for 15 minutes.

CHOW MEIN

2 cups soy sprouts	1 can mushrooms with liquid
2 cups onions sliced	Seasoning to taste
4 tbs. margarine or oil	2 tbs. soy sauce
2 cups cooked meat—beef, veal, lamb, or pork	Flour for thickening

Cook sprouts 10 minutes. Fry onion in fat until brown, add cooked sprouts, diced meat, and chopped mushrooms with liquid. Add water from sprouts, and more water if necessary, to cover. Season as desired and add soy sauce. Thicken mixture with a small amount of flour (whole wheat preferred), cover, and cook for 10 minutes. Serve with noodles or rice.

SPROUT CASSEROLE

2 cups cooked sprouts	White sauce
1 can whole-kernel corn	4 tbs. minced green pepper
Seasoning to taste	Melba toast crumbs

Mix cooked sprouts, corn, and pepper. Season to taste, almost cover with white sauce. Top with Melba toast crumbs and bake in moderate oven 25 minutes.

SPROUT TOMATO SAUCE

1 cup cooked bean sprouts	1 cup chopped pepper
2 small onions	2 cups stewed tomatoes
2 tbs. margarine or oil	Salt and seasoning as desired
$\frac{1}{2}$ cup chopped celery	

Fry onions in fat until brown, add rest of ingredients, cover, and simmer 10 to 15 minutes. Serve with meat-substitute dish or omelet.

SPROUTS AND POT ROAST

Add 1 cup soy sprouts to pot roast 15 minutes before meat is done. Serve sprouts around meat or with gravy.

The following eight recipes are from the New York State Emergency Food Commission Nutrition Service:

SAUTÉED SOYBEAN SPROUTS AND ONIONS*

1 lb. soybean sprouts	2 to 4 tbs. soy sauce
4 tbs. shortening	tbs. cornstarch paste
3 onions, chopped fine	4 tbs. water
1 cup chicken stock	

Cook soybeans at a rapid boil for 20 minutes, skimming off hulls as they rise to the top of the kettle. Melt shortening and then sauté, tossing sprouts lightly in the pan. Add chicken stock and soy sauce. Thicken with the cornstarch paste and serve hot. Add seasoning as desired.

BEAN SPROUT AND CHICKEN SOUFFLE*

4 eggs	1 cup clear chicken meat, cut in small cubes
3 tbs. fat	
4 tbs. flour	1 cup blanched bean sprouts
1 cup milk	chopped slightly (steamed or cooked in boiling water 25 minutes)
1 tsp. salt	

Separate eggs. Beat yolks slightly and add to white sauce. Cook 3 to 4 minutes. Cool somewhat; then add chicken and bean sprouts. Beat whites until stiff and almost dry. Combine carefully and put in greased baking pan. Bake in slow oven, 300 to 325°, for 40 to 50 minutes. Set soufflé in pan of hot water while baking. Serve immediately.

MEATLESS CHOP SUEY

$\frac{1}{2}$ cup fat or drippings	3 cups sprouted beans
2 large green peppers, cut in cubes or strips	1 cup boiling water
1 cup onion, cut in thin strips	$\frac{1}{4}$ cup flour
2 cups celery, cut in medium-sized pieces	$\frac{1}{8}$ tsp. pepper
	tsp. salt
	2 tsp. soy sauce†

* Served at Governor Dewey's luncheon (see p. 81).

† In place of soy sauce, use the following mixture: 3 tbs. molasses, pinch of ginger, 2 tbs. Worcestershire sauce and mix with flour.

Melt fat in large skillet. Add green peppers, onion, celery, and sprouted beans. Sauté for 2 minutes but do not brown. Add the boiling water. Cover. Cook 7 minutes. Make a paste of the flour, soy sauce, and a little water if needed. Add to the vegetable mixture and cook for 3 minutes. Serve piping hot over noodles or rice.

CHOP SUEY WITH MEAT

- | | |
|--|--|
| 1 tbs. fat | 6 cups bean sprouts |
| 1 lb. hamburger or other ground meat, or 1 pt. canned or left-over chicken | 1 cup green pepper, cut in large cubes |
| 1 cup onions, cut in thin strips | 2 tsp. soy sauce |
| 1½ cups celery, diced in large pieces | 1 cup boiling water |
| | 1 tbs. flour |

Melt fat in large skillet. Add meat and onions and cook until meat is brown. Add celery, bean sprouts, pepper, soy sauce, and water and salt. Cover and cook 7 to 10 minutes. Make paste with flour and stir into the meat-vegetable mixture. Heat until thick. Serve with hot rice or noodles.

SPROUTED SOYBEAN CREOLE

- | | |
|----------------------------------|---------------|
| 3 cups sprouted soybeans, cooked | 1 tsp. salt |
| 4 celery stalks, cut fine | ⅛ tsp. pepper |
| 1 clove garlic (optional) | 2 bay leaves |
| 1 tbs. fat | 1 onion |
| 1 large can tomatoes | |

Wash and steam the sprouted soybeans 10 to 15 minutes. Chop onion, celery, and garlic fine. Lightly brown in the melted fat. Add tomatoes, salt, pepper, and bay leaves. Simmer for 10 minutes. Remove bay leaves. Add steamed sprouted soybeans. Cook 5 minutes longer.

SPROUTED SOYBEANS AU GRATIN

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|--------------------------|-----------------------------|
| 3 cups sprouted soybeans | ¾ cup sharp cheese, grated |
| 2 tbs. fat | ¼ cup buttered bread crumbs |
| 2 tbs. flour | Salt, pepper, paprika |
| 1 cup milk | |

Steam or boil the sprouts 10 to 15 minutes. Skim off the husks. Melt fat. Stir in flour. Add milk gradually, stirring

constantly until it boils and thickens. Add $\frac{1}{2}$ cup of cheese and the seasoning. Stir until cheese melts. Add sprouts. Pour into greased casserole. Sprinkle with crumbs and rest of cheese. Bake in a moderate oven (350°) until brown.

SPROUTED SOYBEAN CURRY

1 medium-sized onion	1 tsp. salt
1 medium-sized apple	$\frac{1}{8}$ tsp. pepper
2-4 stalks celery	$\frac{1}{2}$ cup raisins, seedless
2 tbs. fat	3 cups sprouted soybeans
$1\frac{1}{2}$ cups meat stock or bouillon	(steamed or boiled 10-15 minutes)
2 tbs. flour	
1 tsp. curry powder	

Cut onion, apple, and celery up fine. Lightly brown in hot fat. Add stock or bouillon. Mix flour, curry powder, salt, and pepper together, and make a paste with a small amount of water. Stir paste into vegetable mixture thoroughly. Add $\frac{1}{2}$ cup raisins. Add cooked sprouted soybeans. Let simmer $\frac{1}{2}$ hour.

SCRAMBLED EGGS WITH SPROUTED SOYBEANS

$\frac{1}{2}$ cup onion tops, chopped fine	4 eggs, slightly beaten
$1\frac{1}{2}$ tsp. salt	2 cups sprouted soybeans
$\frac{1}{4}$ tsp. pepper	

Add chopped onion tops, salt, and pepper to slightly beaten eggs. Let stand 5 to 10 minutes. Wash and cook the sprouted soybeans 10 minutes, in skillet with just enough water to cling to them. Stir to prevent sticking to pan. Add 1 tbs. of fat and cook few minutes longer. Add egg mixture and stir. Cook until done.

ROASTED OR TOASTED SOYBEANS

Salted, toasted soybeans are now becoming a rival of the salted peanut. They are delicious and can be used like any salted nut. Several brands are for sale in the retail stores, but they can readily be prepared at home.

SALTED SOYBEANS

Because soybeans contain so much protein and fat, they are good fried in deep fat and salted to serve like salted nuts.

table varieties may be used. Wash and soak the dry beans overnight, then drain and spread them out at room temperature until the surface is dry. Fry a few at a time in deep fat at 350°, for 8 to 10 minutes. Drain on absorbent paper and sprinkle with salt while still warm.

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OVEN-ROASTED SOYS

Soak beans overnight. Boil for 1 hour in salted water. Drain. Spread in shallow pan and roast in 350° oven for 30 minutes or until brown. Sprinkle with salt while warm.

GROUND TOASTED SOYBEANS

Toasted soybeans when ground in the food chopper can be used in a variety of recipes. Grind beans using medium-fine knife. If not used at once, store in tightly covered jar.

SOY TOPPINGS

Use ground toasted soybeans as topping for gelatin desserts, custards, puddings, or ice creams, or over salads.

CEREALS

Add ground toasted soybeans to ready-to-eat cereals or serve a small amount as 100 per cent soy-nut cereal with cream and sugar.

SOY NUTS

Ground toasted soys may be used as chopped nuts, in candies, frostings, cookies, etc. (See Cookie and Cake recipes, pages 277, 283.)

SOY OMELET

Add 1 tbs. ground toasted soybeans for each egg in omelet. Prepare in the usual way.

MEAT-SUBSTITUTE DISHES

Cooked, canned, or ground soybeans and soy grits can be made into delicious loaves, patties, and casserole dishes to be used in place of meat or fish.*

COOKED GROUND SOYBEANS

1 cup dry soybeans

Water as needed

1 tsp. salt

* For sauces and gravies, see p. 224.

Soak the beans overnight in enough water to cover them. In the morning, drain, and grind in food chopper, using medium knife. The ground beans resemble creamed corn and may be cooked in a pressure cooker or in an ordinary pan. For pressure cooking, add $\frac{1}{2}$ to 1 cup water, 1 tsp. salt, and cook 15 minutes. For ordinary pan, add salt and 3 to 4 cups water. Cook, stirring occasionally for several hours until soft. The cooked beans may be used in various ways, by themselves with extra seasoning, or for patties, loaves, casserole dishes, stuffed tomatoes and peppers, or soups.

VEGETIZED GROUND SOYS

3 cups cooked ground beans	$\frac{1}{2}$ to 1 cup tomato juice
3 tbs. butter or margarine	1 tbs. soy sauce or meatlike
1 tbs. powdered vegetable broth	flavoring
or 1 bouillon cube	2 tbs. minced onion

Melt butter, add finely minced onion, and brown slightly. Add broth, other seasonings, and tomato juice, and cook a few minutes. Add ground soybeans. Stir until well blended. Cook until almost dry.

SOYBURGERS

2 cups vegetized ground soy- 2 eggs
beans (see preceding recipe)
1 cup wheat germ, bran, or fine
crushed Melba toast crumbs

Beat eggs, add vegetized soybeans, mix in wheat germ, bran, or crumbs. Blend thoroughly. Shape as hamburgers or patties, dip in wheat germ, bran, or crumbs, and brown in butter or bacon fat. Serve with gravy or tomato sauce.

GROUND SOYBEANS IN GRAVY

Cook ground soybeans until tender. Season as desired and pour into casserole. Almost cover with brown gravy. Bake 20 minutes. Cooked onions are a good addition to this casserole dish.

GROUND SOYS À LA CASSEROLE

3 cups ground cooked soybeans	$\frac{1}{2}$ cup whole-wheat or soy bread crumbs
1 cup diced celery	
1 cup sliced onions	2 tbs. melted butter or oil
2 cups tomato pulp	$\frac{1}{2}$ tsp. salt
	Other seasoning as desired

Mix ground cooked beans, onions, celery, oil, or melted butter, salt, and other seasoning (vegetable broth, meatlike flavoring, and so forth), and place in casserole. Pour in tomato pulp, top with crumbs, and bake in slow oven 1 to $1\frac{1}{2}$ hours.

SOY LOAVES

Cooked or canned soybeans may be made into loaves, patties, mock sausages, and casserole dishes. The beans may be plain or with tomato sauce and may be whole, mashed, or ground. Always use liquid on canned beans. Ground cooked soybeans may be used in any loaf calling for mashed or ground beans.

SOY LOAF I

1 can or 2 cups cooked soybeans	1 tbs. powdered vegetable broth
1 cup cooked celery	$\frac{1}{4}$ cup Melba toast crumbs
1 cup cooked carrots	Sliced tomato or bacon

Mash soybeans, add cooked vegetables, Melba toast crumbs, and vegetable broth. Mix well. Place in buttered loaf pan, top with sliced tomatoes or strips of bacon, and bake in hot oven 20 to 30 minutes.

SOY LOAF II

1 lb. canned soybeans	$\frac{1}{2}$ tsp. celery salt
1 cup milk or soy milk	1 bouillon cube
1 egg	$1\frac{1}{2}$ cups Melba toast crumbs
1 tbs. butter or oil	1 small onion
$\frac{1}{2}$ tsp. sage	

Grind or mash soybeans, add ground or finely grated onion, beaten egg, and other ingredients. Mix thoroughly and bake in an oiled loaf pan 30 to 40 minutes. May be served plain or with tomato sauce.

SOY LOAF III

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|-------------------------|---|
| 1 can soybeans (2 cups) | $\frac{1}{2}$ cup cracker crumbs (soy pre-ferred) |
| 2 slices bacon | |
| 1 medium-sized onion | $\frac{1}{2}$ cup tomato soup |
| 1 egg | Little salt if necessary |

Grind beans, onion, bacon, and crackers in food chopper. Beat egg and add ground ingredients. Mix well, adding a little more salt if necessary. Add $\frac{1}{4}$ cup tomato soup and pour mixture into greased loaf pan. Cover top with the rest of the tomato soup. Bake in moderate oven 40 minutes. Serve with desired sauce or gravy.

SOY LOAF IV

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|--|--|
| 2 cups cooked and mashed soy-beans | 2 tbs. minced onion |
| $\frac{1}{2}$ cup whole-wheat bread crumbs | 4 tbs. minced ripe olives |
| 2 eggs | 2 tbs. butter, margarine, or oil |
| 1 cup milk | 1 tsp. powdered vegetable broth or celery salt |

Mix all ingredients. Pack into oiled loaf pan and bake for 30 minutes in moderate oven. Delicious when topped with sliced bacon. Serve with tomato sauce.

SOY RICE LOAF

- | | |
|--------------------------------------|---------------------------------|
| 2 cups mashed soybeans | 1 tbs. oil |
| 1 cup cooked rice (brown pre-ferred) | 1 tbs. powdered vegetable broth |
| 1 cup milk | 2 tbs. minced onion |
| $\frac{1}{2}$ cup soy cracker crumbs | Salt as desired |

Mix well and bake in oiled loaf pan for 35 minutes. If desired, moisten top with a little tomato sauce or soup.

SOYBEAN SPINACH LOAF

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|--------------------------|--------------------------------------|
| 1 can or 2 cups soybeans | $\frac{1}{2}$ cup Melba toast crumbs |
| 1 cup raw ground spinach | Seasoning as desired |
| 1 cup cooked celery | |

Mash beans, add vegetables, and mix well. Pour in buttered baking dish and bake 30 minutes in a moderate oven. When

done, dot with butter and serve with tomato sauce. May be baked with sliced tomatoes or bacon.

SOY LENTIL LOAF

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|---------------------------------|---------------------------------|
| 1 cup cooked lentils | 2 cups milk or 1 cup milk and 1 |
| 1 cup cooked or canned soybeans | cup tomato soup |
| 2 cups whole-wheat or soy bread | 1 tbs. powdered vegetable broth |
| crumbs | or 1 tsp. poultry seasoning |
| 2 tbs. minced parsley | |

Mix all together, pack into oiled loaf pan, and bake in moderate oven 30 to 40 minutes. Serve with gravy or tomato sauce.

SOY AND MUSHROOM LOAF

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|------------------------|-------------------------|
| 2 cups cooked soybeans | $\frac{1}{2}$ cup cream |
| 1 cup diced mushrooms | 1 egg |
| 1 tbs. flour | 1 cup bread crumbs |
| 3 tbs. butter | $\frac{1}{4}$ tsp. salt |

Slice mushrooms and brown slightly in 1 tbs. butter. Melt 2 tbs. butter, stir in flour and cream. Add beaten egg, bread crumbs, mushrooms, soybeans, and salt. Mix thoroughly, place in buttered loaf pan, and bake in moderate oven until brown. Serve with gravy or tomato sauce.

Variations. 1 cup leftover vegetables may be mixed with soybeans as in the above recipe. Tomato or any creamed soup may be used instead of cream. If soup is thick, omit flour. Seasonings may be varied to suit different vegetables and tastes.

SOY ROAST

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|-------------------------------------|--------------------------------|
| 1 $\frac{1}{2}$ cup carrots | $\frac{1}{2}$ cup tomato juice |
| 1 $\frac{1}{2}$ cup cooked soybeans | 1 minced onion |
| cup cooked beets | 2 eggs |
| cup bread crumbs | Sage and salt to taste |

Mash or grind carrots, soybeans, and beets. Add crumbs, tomato juice, minced onion, and beaten eggs. Mix and season to taste. This loaf should be moist; if too dry, add more tomato juice. Place in greased loaf pan and bake 45 minutes in moderate oven.

SOYBEAN EGG LOAF

3 cups cooked soybeans	1 egg beaten slightly
2 cups chopped walnuts	1 tbs. meatlike paste
2 cups mashed potatoes	2 tbs. grated onion
1 cup milk	2 tbs. chopped green pepper
2 eggs scrambled to golden brown	4 tbs. tomato pulp or purée

Purée cooked soybeans. To this purée add hot mashed potato, nuts, milk, seasonings, scrambled eggs, and the beaten egg. Mix lightly. Pour into oiled baking dish and bake slowly 1 hour. Turn baked loaf out on platter and garnish with sliced tomatoes and parsley. Serve with desired sauce or gravy.

SOY VEGETABLE LOAF

2 cups cooked soybeans	tsp. salt
$\frac{3}{4}$ cup cooked carrots	cup dry bread crumbs
2 tbs. chopped onion	
$\frac{3}{4}$ cup celery	
$\frac{3}{4}$ cup fresh or canned tomatoes	

Grind all ingredients in food chopper. Add salt, tomatoes, and liquid, and mix well. Pack into greased loaf pan. Bake for 45 minutes in moderate oven. May be topped with sliced tomatoes or bacon.

CANNED SOY ROASTS AND LOAVES

There are any number of excellent soy roasts, loaves, and meat-substitute foods on the market that are tasty, ready to use, and can be served hot or cold. The usual method of preparation is to remove the contents from the can by opening both ends and pushing out, then slicing and heating. The slices may be fried in fat, breaded, dipped in eggs and fried, heated in gravy or sauce, or broiled. Sliced, they serve as cold cuts and can be used for sandwiches. Mashed, they make good sandwich spreads. Diced, these foods can be served in cream sauce à la king. They are also good additions to salads.

Vegetarians and many others have used these products for years, and meat and fish shortages have created a demand for foods of this type in every grocery store. They are well worth trying.

SOYBEANS SOUTHERN STYLE

2 cups cooked soybeans	2 cups tomatoes (canned or fresh)
2 cups corn (canned or fresh, preferably fresh)	1 tsp. salt
1 cup grated cheese or soy cheese	1 scant cup buttered bread crumbs

Put alternate layers of the beans, corn, cheese, and drained tomatoes into a greased baking dish. Mix the salt with the juice drained from the tomatoes and pour over the mixture. Cover with the buttered crumbs and bake in a moderate oven for 30 minutes, or until the crumbs are brown. Serves 8.

SOYBEANS CREOLE

2 cups cooked or canned soybeans	3 tbs. whole-wheat flour
2 tbs. chopped onion	Salt and seasoning to taste
4 tbs. minced green pepper	1 cup cooked or canned tomatoes
2 tbs. butter or margarine	1 cup brown stock

Sauté onion and pepper in the butter or margarine. Add flour and seasoning and blend well. Add tomatoes and stock and cook 2 or 3 minutes. Add soybeans and simmer 10 minutes. Serve in individual bean pots or ramekins, topped with minced parsley.

SOYBEAN CASSEROLE

Mix 1 can soybeans plain or with tomato sauce with 2 cups cooked low-starch vegetables, such as carrots, celery, asparagus, or summer squash. Place in casserole and bake 15 minutes in moderate oven. Serve from casserole. Top with bacon if desired

SOYBEAN CASSEROLE

2 cups mashed or hopped cooked soybeans	2 tbs. chopped green pepper
$\frac{1}{4}$ cup diced salt pork or bacon	2 cups white sauce
2 cups chopped celery	1 tsp. salt
4 tbs. chopped onion	1 cup whole-wheat or soy bread crumbs

Brown pork in heavy pan, add celery, onions, and pepper, and sauté for about 5 minutes. Add white sauce and bring to boiling point. Add beans and pour mixture into an oiled casserole.

Cover with crumbs and bake in moderate oven 45 minutes or until brown. Serve from casserole.

SOYBEAN SCALLOP

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|--------------------------------|--|
| 3 cups cooked soybeans | 1 tbs. powdered vegetable broth |
| 1 cup diced celery | 1 cup of water or liquid from beans |
| 1 small chopped onion | $\frac{1}{2}$ cup whole-wheat bread crumbs |
| $\frac{1}{2}$ cup tomato sauce | 2 tbs. butter or vegetable oil |
| $\frac{1}{2}$ tsp. salt | |

Place beans, celery, and seasonings in baking dish. Add water. Cover with crumbs and bake in 350° oven for 1 to 1½ hours.

SOY SAUSAGES

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|---|--|
| 2 cups cooked or canned soybeans | $\frac{1}{2}$ tsp. salt |
| | 1 egg |
| $\frac{1}{2}$ cup whole-wheat or Melba toast crumbs | 2 tsp. vegetable broth or $\frac{1}{2}$ tsp. poultry seasoning |

Mash or grind beans, add crumbs, seasoning, salt, and slightly beaten egg. If mixture seems too dry, add a little milk. Shape into sausages, roll in crumbs, and brown in a small amount of fat. Sausages may be baked in moderate oven. Serve with tomato sauce.

FRITTERS

- | | |
|---|---------------------------------|
| 2 cups mashed, cooked, or canned soybeans | Salt as desired |
| 2 eggs | 2 tsp. powdered vegetable broth |
| | 1 or 2 tbs. tomato sauce |

Mash beans and add to beaten eggs. Mix in vegetable broth, tomato sauce, and a small amount of salt. Bake as fritters on a hot, heavy, slightly greased griddle.

QUICK PATTIES

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|---|------------------------|
| 1 medium-sized can soybeans in tomato sauce | 1 small onion |
| 2 slices bacon | 1 egg |
| | cup soy cracker crumbs |

Grind beans, bacon, onion, and crackers in food chopper. Add mixture to beaten egg. Salt usually need not be added, because beans, bacon, and crackers contain salt. Drop 1 tbs.

or more of mixture on a hot griddle greased with a small amount of bacon fat. Brown on both sides. Serve hot with tomato sauce.

SOYBEAN CHOPS

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|--------------------------------|--------------------------------------|
| 1 can soybeans in tomato sauce | $\frac{1}{2}$ tsp. salt |
| 1 cup cooked rice | $\frac{1}{2}$ tsp. celery salt |
| 2 tbs. chopped onion | 1 cup soft bread crumbs (not packed) |
| 2 eggs | |

Mash soybeans; mix all ingredients together. Form into patties and bake in moderate oven (375°) until brown, approximately 45 minutes. Serves 6.

PEANUT BUTTER SOY PATTIES

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|-----------------------|---------------------------|
| 1 cup mashed soybeans | 4 tbs. Melba toast crumbs |
| 2 tbs. peanut butter | |

Mix all together, shape into patties, roll in Melba toast crumbs, and place in buttered pan. Brown in moderate oven.

STUFFED TOMATOES

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|-----------------------------------|----------------------------|
| 2 cups cooked and mashed soybeans | Desired seasoning |
| | 1 tsp. minced onion |
| 1 cup cooked celery | 1 tsp. minced green pepper |

Remove pulp from firm tomatoes, sprinkle inside with salt. Mix soybeans, celery, onion, pepper, and seasoning with tomato pulp. Fill tomatoes with mixture, top with buttered crumbs, and bake in moderate oven 30 minutes or until tomatoes are soft.

STUFFED PEPPERS

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|--|---|
| 2 cups mashed cooked soybeans | $\frac{1}{4}$ cup tomato sauce or tomato pulp |
| $\frac{1}{4}$ cup minced onion | |
| $\frac{1}{2}$ cup finely chopped celery | $\frac{1}{2}$ tsp. salt |
| $\frac{1}{2}$ cup finely shredded carrot | |

Remove seeds and partitions from inside of green peppers; boil 3 minutes; drain and sprinkle inside with salt. Fill with mixture of mashed soybeans, onion, celery, and carrot moistened with tomato sauce. Top with crumbs and bake 30 minutes or until peppers are soft.

SOY OMELET

2 cups mashed or sieved soybeans $\frac{1}{2}$ tsp. salt
4 eggs 4 tbs. cream

Beat yolks and whites separately. Add the mashed beans and cream to the beaten yolks. Fold the whites lightly into the mixture. Pour into a hot buttered baking pan and bake 20 minutes in a quick oven. Serve with minced parsley.

SOY SOUFFLÉ

$1\frac{1}{2}$ cups mashed or sieved soy- $\frac{1}{2}$ tsp. salt
beans 1 bouillon cube or 1 tsp. pow-
3 eggs dered vegetable broth

Beat eggs separately and add soybeans to yolks with seasoning. Fold in beaten whites. Pour in buttered baking dish and bake in pan of hot water in moderate oven until firm, 30 to 45 minutes. Serve hot with butter.

SOY SOUFFLÉ II

3 cups mashed soybeans 2 tbs. minced parsley
3 eggs Salt and seasoning to taste
2 tbs. minced onion

Beat egg yolks and add other ingredients. Fold in beaten whites and pour into oiled baking dish. Bake in 325° oven for about 30 minutes. Serve immediately.

SOYBEAN GRITS

Soybean grits, or quick-cooking cracked soybeans (see Chap. V, page 94), as they are often called, make excellent meat-substitute dishes, loaves, and patties. The cooked grits may be used as cooked bean pulp or mashed beans. For meatlike flavor, add soy sauce or desired meatlike seasoning. The grits may be coarse, medium, or fine. Puffed grits may also be used.

COOKED SOY GRITS

Cook soy grits as for cereal. They swell almost three times their volume and require only 3 to 5 minutes' cooking. For loaves and patties, have cooked grits as dry as possible.

The basic rule is

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|--------------|-------------------------|
| 1 cup grits | $\frac{1}{2}$ tsp. salt |
| 2 cups water | |

Add grits to boiling salted water. Cook until dry, stirring occasionally to prevent burning. Grits are now ready to use in several different ways as loaves, patties, casserole dishes, and so forth.

VEGETIZED SOY GRITS—MEATLESS

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|---------------------|----------------------------------|
| 2 cups cooked grits | $\frac{1}{2}$ cup meatless gravy |
|---------------------|----------------------------------|

Have cooked grits as dry as possible. Add to the following sauce. Serve immediately when well browned.

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|--|------------------------------|
| 3 tbs. butter, margarine, or oil | 1 tbs. soy sauce or meatlike |
| $1\frac{1}{2}$ tbs. powdered vegetable | seasoning |
| broth | $\frac{1}{2}$ cup water |

Melt butter or margarine, add broth, soy sauce, and water. Boil 1 minute. Add cooked grits and cook until well browned. Stir constantly. Serve hot with vegetables.

Variations. Onions, celery, and other vegetables may be added.

Celery salt, bouillon cubes, and so forth, may be used instead of powdered vegetable broth.

Rich meat gravy may be used instead of meatless sauce.

SOY GRIT LOAF I—EGGLESS

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|---------------------------------|--|
| 2 cups cooked soy grits | 1 tbs. minced onion |
| 1 tbs. powdered vegetable broth | $\frac{1}{2}$ cup tomato juice or soup |
| or desired seasoning | 1 cup Melba toast crumbs |
| 2 tbs. minced parsley | |

Mix all together and pack into baking pan. Moisten top with tomato juice or soup and bake until brown. Dot with butter to serve.

SOY GRIT LOAF II

- | | |
|----------------------------------|----------------------------|
| 1 cup grits | 1 tbs. vegetable seasoning |
| 2 cups water | 2 slices bacon |
| 1 tsp. salt | 1 small onion |
| $\frac{1}{2}$ cup cracker crumbs | 2 eggs |
| $\frac{1}{2}$ cup milk | |

Cook grits with salt in boiling water until dry. Run bacon, crackers, and onion through food chopper. Add to cooked beans with seasoning, beaten eggs, and milk. Mix well. Place in loaf pan and bake 1 hour in moderate oven.

This mixture may be used for patties. Brown in a small amount of fat.

SOY VEGETABLE HASH

2 cups cooked grits	$\frac{1}{2}$ cup minced olives
2 cups cooked low-starch vegetables, such as celery, carrots, or summer squash	1 tbs. powdered vegetable broth
	1 tbs. soy sauce or meatlike seasoning

Mix all together. Pour in shallow oiled pan, cover with sliced tomatoes, and bake in hot oven until brown.

SOY VEGETABLE MULLIGAN

This is an excellent inexpensive dish and can be made with any vegetable desired. To 6 cups of boiling water add 1 small bunch of chopped celery. Cook 10 minutes. Then add 4 diced carrots, 1 diced rutabaga, 1 diced turnip, 1 good-sized celery root, 3 or 4 sprays of parsley, 1 medium-sized onion (diced), and $\frac{1}{2}$ cup of soy grits. Cook until vegetables are done. Then add 1 small can of peas, and 1 tbs. soy sauce or other seasoning. Butter or oil may be added for extra richness. Canned soybeans may be used in place of the grits, and soy macaroni may also be added.

GRIT CASSEROLE

2 cups cooked soy grits	1 cup stewed tomatoes
1 cup cooked carrots	2 tsp. powdered vegetable broth
1 cup cooked celery	2 tbs. minced parsley

Mix all together, pour into buttered casserole, top with Melba toast crumbs, and bake until brown. Dot with butter to serve.

ZUCCHINI CASSEROLE

3 cups sliced zucchini	1 tsp. salt
6 tbs. soy grits, regular or puffed	1 can tomato soup

Wash and slice zucchini; do not peel. Put in layers in casserole, sprinkling each layer with soy grits. Fill casserole and top

with a few grits. Pour in tomato soup, adding water if necessary to cover. Cover and bake in moderate oven until done. Remove cover to brown. Do not have casserole too full, because grits swell. Minced onion may be added if desired.

Variations. This recipe may be made with any vegetable; and milk, soup stock, cream soup, or white sauce may be used in place of tomato soup.

EGGPLANT CASSEROLE

1 eggplant	$\frac{1}{3}$ cup soy grits
1 green pepper	2 cups stewed or canned tomatoes
1 small onion	Seasoning to taste

Peel and dice eggplant. Chop pepper and onion. Place a layer of diced eggplant in casserole. Top with layer of green pepper and onion and sprinkle on the soy grits. Top with rest of eggplant, pepper, and onion. Add tomatoes. Cover and bake 40 minutes in a moderate oven.

SOY EGGPLANT PATTIES

Eggplant acts as binder in this recipe.

Peel and dice eggplant. Steam or cook until tender. Mash and season with salt, vegetable broth, and soy sauce as desired. Work in 2 cups of cooked soy grits. Have grits as dry as possible. The amount varies depending on the size of the eggplant. Mix well and shape into patties. Roll in Melba toast crumbs, bake on buttered tin until brown. Serve with gravy or tomato sauce.

Variations. A nut patty may be made by using ground almonds in place of soy grits.

STUFFED CABBAGE LEAVES

Cook 1 cup of soy grits in boiling salted water until as dry as possible. Add lump of butter, desired amount of salt and other seasoning, 1 tbs. soy sauce or meatlike flavoring, and $\frac{1}{2}$ cup minced ripe olives. Mix well and fill center of well-washed cabbage leaf. Close ends and pin together with toothpick. Place in shallow oiled pan, add a small amount of water, and bake until leaves are done. Serve hot with gravy or sauce.

SOY-STUFFED TOMATOES

Cook soy grits and season as desired. Add a small amount of minced onion and minced green pepper. Fill firm scooped-out tomatoes with mixture. Place on oiled tin and bake in moderate oven until tomatoes are done. Add dot of butter and a topping of minced parsley and serve hot.

SOY GRIT CROQUETTES I

$\frac{3}{4}$ cup stewed or canned tomatoes	2 cups cooked soy grits
2 tbs. minced onions	1 cup cooked diced celery
2 tbs. soy flour	

Add minced onion to tomatoes. Bring to boil, add soy flour, and cook until thick. Cool. Add celery and soy grits. Mix well and shape into croquettes. Dip in Melba toast crumbs and bake on oiled tin in moderate oven 20 minutes. Serve with gravy or sauce.

SOY GRIT CROQUETTES II

2 cups cooked grits	$\frac{1}{2}$ cup bread or cracker crumbs
1 cup cooked brown rice	$\frac{1}{2}$ tsp. salt
5 tbs. minced onion	1 tbs. powdered vegetable broth
1 tbs. fat	Other seasoning to taste
1 egg	

Brown onion in fat. Add cooked grits, rice, and seasoning. Mold into croquettes, dip in beaten egg, then in corn meal. Place in shallow greased pan and bake in hot oven about 30 minutes or until brown. Serve with gravy or tomato sauce.

SOY GRIT FRITTERS

1 cup soy grits	2 eggs
2 cups water	1 tbs. soy sauce
$\frac{1}{2}$ tsp. salt	Vegetable seasoning if desired

Cook grits in water until dry, 3 to 5 minutes. Add to beaten eggs and soy sauce. Mix well. Drop from tablespoon onto a hot greased griddle. Do not turn until well browned on one side. Make these cakes quite thick. Serve hot with sauce or gravy.

SOY GRIT PATTIES—EGGLESS

2 cups cooked soy grits 2 tbs. butter
 1 tbs. powdered vegetable broth Melba toast crumbs
 1 or 2 tsp. meatlike flavoring sauce

Have cooked grits as dry as possible. While hot add butter, broth, and seasoning. Mix well. Drop by spoonfuls into finely crushed Melba toast crumbs. Cover well. Handle as little as possible and shape into patties. Place on oiled tin and bake in hot oven until brown. They will hold their shape when baked. Serve with tomato sauce.

SOY GRIT OMELET

4 egg yolks $\frac{1}{2}$ tsp. salt
 $\frac{1}{4}$ cup soy grits mixed with $\frac{1}{4}$ 4 egg whites plus 4 tbs. water
 cup water 1 tbs. fat

Separate eggs and beat yolks until thickened. Add soaked soy grits and blend thoroughly. Add salt and water to egg whites and beat until stiff. Fold in yolk mixture and pour into skillet containing the melted fat. Cover and cook slowly over a low flame until set around edges. Remove cover, place in 300° oven for 15 minutes to complete cooking, and brown slightly on top. Fold over and serve. Omelet may be sprinkled with grated cheese before folding.

SOY CHEESE SOUFFLÉ

2 tbs. margarine $\frac{1}{4}$ cup soy grits
 2 tbs. whole-wheat flour $\frac{3}{4}$ tsp. salt
 1 cup milk or soy milk 4 eggs, separated
 $\frac{1}{2}$ cup grated cheese

Melt fat, blend in flour, and add milk. Cook over low flame until thick. Add grated cheese, and stir until it melts. Add dry soy grits and salt. Pour this mixture into beaten egg yolks and fold into stiffly beaten whites. Pour into greased casserole and bake in a 300° oven until mixture sets, or about 1 hour. Serve hot.

SCRAMBLED EGGS AND SOY PUFFS

4 eggs tsp. salt
 $\frac{1}{2}$ cup milk tbs. butter or margarine
 4 tbs. puffed soy grits

Beat eggs slightly until yolks and whites are blended; add milk, puffs, and salt. Melt fat in heavy skillet, turn in egg mixture and cook at a low temperature until creamy, scraping the cooked portion from the side of the pan so that the uncooked part will reach the bottom. When done, remove from pan, and serve immediately.

SOY FRENCH OMELET

4 eggs	$\frac{1}{4}$ tsp. salt
$\frac{3}{4}$ cup milk	4 tbs. puffed soy grits

Beat eggs slightly until yolks and whites are blended; add milk, grits, and salt. Pour mixture into a heavy dry hot pan, stirring constantly until mixture is the consistency of a soft custard. Remove at once from pan, dot with butter, and serve.

100 PER CENT SOYBEAN PANCAKES

These may be used as a meat-substitute dish.

2 eggs	1 tsp. soda
1 cup buttermilk	1 to $1\frac{1}{4}$ cups soy flour
$\frac{1}{2}$ tsp. salt	

Beat eggs well; add salt and buttermilk to which the soda has been added. The amount of flour depends on the size of the eggs and desired thickness of batter. Bake as griddle cakes with as little fat as possible. Do not turn until well browned.

SOY GRIT PANCAKES

2 eggs	$\frac{1}{2}$ tsp. soda
1 cup buttermilk	1 cup medium or fine grits
$\frac{1}{2}$ tsp. salt	

Beat eggs well, add buttermilk, salt, soda, and grits. Let mixture stand for a few minutes to allow grits to soften. Bake as pancakes on a hot griddle. Cakes will be quite thick and are crunchy. For meatlike flavor, add a small amount of soy sauce. Serve with vegetables and gravy or tomato sauce.

Meatless creole spaghetti and soy macaroni loaf (page 223) are also excellent meat-substitute dishes.

SOY-ENRICHED MEAT DISHES

Soy grits, regular or puffed, and soy flour may be used to stretch meat loaves, patties, sausage, and so forth. The addition of the soy greatly increases the protein content and lessens the loss of juices in frying as much as 15 per cent. Additional water is always necessary, and additional seasoning is advisable.

Regular Grits. Soak grits in water or cook as cereal. Use $\frac{1}{3}$ cooked or soaked soy grits, $\frac{2}{3}$ ground meat (any kind available). Mix well, blending the grits thoroughly into the meat. Then follow regular recipe for loaf, pattie, or sausage. Less grits may be used or as much as half grits and half ground meat.

Soy Flour. Use 1 lb. ground meat, $\frac{1}{2}$ cup soy flour, and $\frac{1}{2}$ cup liquid. Mix flour with meat, add liquid, and follow regular recipe. More or less soy flour may be used with the proper amount of liquid.

Puffed Soy Grits. Use 1 lb. ground meat, 1 cup puffed soy grits, and $\frac{1}{2}$ cup liquid mix, and follow regular recipe.

Secure additional recipes from concerns packaging soy flour and soy grits. Also write the U.S. Department of Agriculture, Washington, D.C., for the booklet entitled, "Cooking with Soy Flour and Soy Grits."

SOY MEAT LOAF

2 cups ground meat (about 1 lb.)	Other seasoning as desired
1 cup cooked grits	1 tbs. powdered vegetable broth
1 tsp. salt	$\frac{1}{4}$ cup tomato soup

Cook 6 tbs. soy grits in 1 cup of water. This will make 1 cup cooked grits. Have as dry as possible. Mix grits and meat, blending well. Add salt and seasoning. Shape into loaf. Place 2 tbs. tomato soup in bottom of small casserole, add meat, top with rest of tomato soup, and bake until done. If only lean meat is used, brush top with fat or oil or top with slice of bacon. This loaf does not contain eggs and yet holds together and slices well.

SOY-FLOUR MEAT LOAF

2 cups ground meat (about 1 lb.)	Other seasoning as desired
$\frac{1}{2}$ cup soy flour	$\frac{3}{4}$ cup tomato soup
1 tsp. salt	1 tbs. powdered vegetable broth

Mix ground meat, soy flour, seasoning, and $\frac{1}{2}$ cup tomato soup. Mix well and shape into loaf. Place 2 tbs. tomato soup in small casserole. Add meat loaf, and top with rest of soup. Bake 1 hour in 350° oven.

SOY MEAT LOAF I

2 lb. ground meat	4 tbs. minced celery or celery
$\frac{3}{4}$ cup soy flour	leaves
2 tsp. salt	2 tbs. minced parsley
4 tbs. minced onion	$\frac{2}{3}$ cup milk

Combine meat, flour, salt, onion, parsley, celery, and milk. Mix well and shape into loaf. Place on greased baking pan and bake in moderate oven $1\frac{1}{2}$ hours.

SOY MEAT LOAF II

$\frac{3}{4}$ lb. ground meat	$\frac{3}{4}$ cup soy grits
$1\frac{1}{2}$ cups vegetable stock, tomato	2 tbs. chopped parsley
juice, or milk	2 tsp. salt
2 oz. salt pork, diced	$\frac{3}{4}$ cup bread crumbs
2 tbs. chopped onion	$\frac{1}{8}$ tsp. pepper
$\frac{1}{2}$ cup chopped celery	

Select one kind of meat or a mixture of two or more kinds. Blend the vegetable stock, tomato juice, or milk with the meat. Fry the salt pork until crisp and remove from the fat. Cook the onion and celery in the fat for a few minutes. Add all the ingredients to the meat and mix well. Mold the loaf on a piece of tough paper with the hands. Place the paper and loaf on a rack in an uncovered pan and bake in a moderate oven (350°) until well done and brown, about 1 to $1\frac{1}{4}$ hours.

U.S. Department of Agriculture.

MEAT LOAF III

1 lb. ground beef	1 tbs. chopped green pepper
1 slice salt pork	1 beaten egg
$\frac{1}{2}$ cup fine soy grits	$\frac{1}{2}$ tsp. pepper
$\frac{1}{4}$ cup cracker crumbs	$\frac{1}{2}$ tsp. celery salt
4 tbs. chopped onion	$\frac{1}{2}$ cup milk
2 tsp. salt	1 cup canned tomatoes

Mix ground beef, pork, soy grits, egg, cracker crumbs, chopped onion, green pepper, salt, pepper, celery salt, milk, and canned tomatoes. Mix well, shape into loaf, and bake in a greased loaf pan in moderate oven (350°) for 1 hour and 15 minutes.

VICTORY SOYBEAN LOAF

1 lb. ground lean beef	2 tsp. salt
1 slice ground salt pork	$\frac{1}{4}$ tsp. pepper
$\frac{1}{4}$ lb. soybean grits	$\frac{1}{2}$ tsp. celery salt
2 tbs. soy flour	1 cup milk
2 tbs. chopped onion	1 cup canned tomatoes
1 tbs. chopped green pepper	

Mix all ingredients thoroughly, shape into loaf, and bake in moderate oven (350°), for $1\frac{1}{4}$ hours.

This loaf was served when Governor Dwight H. Green, of Illinois, was host at a victory dinner.

LIVER LOAF

1 lb. beef liver	1 medium-sized onion
2 slices salt pork, $\frac{1}{2}$ in. thick	2 cups soft bread crumbs
$\frac{1}{3}$ cup fine soy grits	2 eggs, slightly beaten
$1\frac{1}{2}$ cups milk	1 tsp. salt
$\frac{1}{4}$ cup chopped parsley	Other seasoning as desired

Wash liver quickly under running water, cover with boiling water, and let stand 10 minutes. Drain. Grind with salt pork and onion, add parsley, crumbs, soy grits, eggs, salt and pepper, and milk. Mix thoroughly. Shape into loaf, place in greased pan, and top with sliced bacon. Bake in moderate oven (350°) about 1 hour or until browned. If desired, gravy can be made from the drippings.

HAM LOAF

$\frac{3}{4}$ lb. ground raw ham	2 tbs. chopped green pepper
$\frac{1}{2}$ lb. ground raw pork	4 tbs. chopped onion
$\frac{1}{2}$ cup fine soy grits	1 cup milk
1 egg, beaten	1 tsp. dry mustard

Combine ingredients in order given. Mix thoroughly. Pack in a greased loaf pan. Bake in moderate oven (350°) about $1\frac{1}{2}$ hours.

PEPPY MEAT LOAF

1 $\frac{1}{4}$ cups boiling water	2 tsp. Worcestershire sauce
1 cup soybean flakes or grits	$\frac{1}{4}$ tsp. pepper
$\frac{3}{4}$ cup diced medium-fat salt pork	1 tsp. celery salt
3 tbs. minced onion	4 tbs. water
1 lb. ground meat	4 tbs. catchup or chili sauce
2 tsp. salt (about)	

Pour boiling water over flakes and let stand while mixing other ingredients. Cook salt pork until yellow; sauté onion in the fat. Combine beef, pork, onion, salt, pepper, Worcestershire sauce, and celery salt. Add flakes and mix thoroughly. Turn into a bread pan. Mix water and catchup and pour over the top. Bake the loaf in moderate oven (350°) 55 to 60 minutes. Serves 10.

New York State Emergency Food Commission.

MEAT BALLS

Prepare ground meat with cooked soy grits as for meat loaf (see recipe 1, page 216). Shape into small balls. Pan-broil slowly in a small amount of fat until well browned. Minced onion, celery, and parsley may also be added to balls.

SOY-FLOUR MEAT BALLS

1 lb. ground meat	Other seasonings as desired
$\frac{1}{2}$ cup soy flour	2 tbs. minced onion
1 tsp. salt	$\frac{1}{2}$ cup tomato soup
1 tbs. powdered vegetable broth	

Mix meat, flour, seasoning, onion, and tomato soup thoroughly. Shape into medium-sized balls and place in heavy skillet with a small amount of fat or margarine. Cover and cook until well browned on both sides. Remove from pan. Make a gravy from drippings, using 1 tbs. or more whole-wheat flour and $\frac{1}{2}$ cup or more water. Reheat balls in gravy and serve at once.

SOY-FLOUR MEAT PATTIES

1 lb. ground meat (any kind available)	$\frac{1}{2}$ tsp. pepper
$\frac{1}{2}$ cup soy flour	$\frac{1}{2}$ cup milk
1 tsp. salt	2 tbs. fat

Combine all ingredients except fat. Mix well and form into 8 patties. Cook slowly in hot fat for 5 to 8 minutes on each side or until nicely browned.

SALISBURY STEAK

Prepare ground meat with soy grits as for meat loaf (see recipe 1, page 216). Add 3 tbs. minced onion. Shape into small steaks and pan-broil in a small amount of fat until brown. Serve with tomato sauce.

Variations. Steak may be pan-broiled in a dry pan or cooked in broiler. For peppery steak, add desired amount of chili sauce, Worcestershire sauce, or prepared mustard.

HAMBURGERS

1 lb. hamburger	1 tbs. water
$\frac{1}{4}$ cup fine grits	Seasoning to taste

Form into cakes and let stand at least over 1 hour in refrigerator. Fry in a small amount of fat.

DOUBLE HAMBURGERS

1 lb. raw beef, ground	3 onions, sliced
$\frac{1}{3}$ cup fine soy grits	2 tbs. butter
1 tsp. salt	6 slices bacon
$\frac{1}{4}$ cup water	

Mix beef, grits, salt, and water thoroughly. Pat this mixture into 12 thin cakes. Spread onion slices that have been browned in butter or margarine on half of the cakes. Top with remaining cakes as a sandwich. Press edges together. Wrap each with a strip of bacon and fasten with a toothpick. Broil on each side about 10 minutes or until brown.

SOY SAUSAGES I

1 lb. country pork sausage	1 tsp. salt
1 cup cooked soy grits	Other seasoning as desired

Mix well. Cook slowly in a slightly greased pan with cover.

SOY SAUSAGE II

Mix well together $\frac{1}{4}$ cup soy flour or grits and $\frac{1}{2}$ lb. all-pork sausage meat. Shape into cakes and fry slowly to form a tender crust. This makes 6 medium-sized cakes.

U.S. Department of Agriculture.

SOY-NUT MEAT LOAF

2 lb. ground meat	1 tbs. powdered vegetable broth
3 medium carrots, shredded	Other seasoning as desired
$\frac{1}{2}$ cup chopped celery	2 cups ground toasted soybeans
1 green pepper, chopped	2 eggs, beaten
1 tsp. salt	

Mix meat, shredded carrots, chopped celery, pepper, seasoning, and toasted soybeans. Add beaten eggs and blend mixture thoroughly. If dry, add a small amount of water or milk. Shape into loaf and place in greased pan or casserole. Bake in moderate oven for 1 hour or more.

MEXICAN CHILE

2 cups dried kidney beans	$\frac{1}{3}$ cup fine soy grits
2 large onions, sliced	3 tbs. water
1 green pepper, dried	4 tsp. salt
6 tbs. fat	2-3 tsp. chili powder
1 lb. ground beef	5-6 cups canned tomatoes

Soak beans overnight and cook partly. Mix thoroughly the meat, grits, water, and 1 tsp. salt. Brown this mixture with onions and green pepper in melted fat. Add beans, tomatoes, the rest of the salt, and chili powder that has been mixed with $\frac{1}{2}$ cup of cold water. Cover and simmer about $1\frac{1}{2}$ hours or until beans and meat are cooked. Serves about 12.

SOY NOODLES, MACARONI, SPAGHETTI

Recently the soybean has made its appearance in the form of soy noodles, macaroni, spaghetti, and so forth. They are not made from entire soy flour but are mixed with wheat or whole-wheat flour. Those made with the whole-wheat flour are darker in color. Both taste good and have become very popular in the last few months. Some are vegetized having added vegetables such as carrots and tomatoes. Soy macaroni and noodles

may be cooked and used like any wheat or egg noodles. They are delicious in soup and in casserole dishes, served with tomato sauce or cheese.

BAKED NOODLES AND MUSHROOMS

- | | |
|-----------------------|-----------|
| 1 package soy noodles | Seasoning |
| 1 can mushroom pieces | Milk |

Place noodles in casserole. Add mushroom pieces and seasoning and enough milk to almost cover. Bake until done.

BAKED SOY MACARONI AND CHEESE

- | | |
|-------------------------|--------------------------|
| 1 cup soy macaroni | 1 tbs. butter |
| 1 cup milk | 1 tbs. whole-wheat flour |
| $\frac{1}{2}$ tsp. salt | Grated American cheese |

Boil macaroni until done but not mushy. Make a white sauce from milk and whole-wheat flour. Add desired amount of grated cheese to sauce. Place macaroni in buttered casserole and pour sauce over it. Sprinkle with grated cheese and bake until brown.

BAKED SOY NOODLES

- | | |
|------------------------------|---------------------------|
| 1 package soy noodles | More seasoning if desired |
| 1 can cream of mushroom soup | Milk |

Place soy noodles in casserole; cover with cream of mushroom soup. If not enough to cover, add milk. Top with crumbs and bake 30 minutes or until noodles are done. Macaroni or spaghetti may be used in place of noodles.

SPAGHETTI AND SOY CHEESE

- | | |
|----------------------------|-------------------------|
| 1 cup cooked soy spaghetti | 1 cup mashed soy cheese |
|----------------------------|-------------------------|

Place these in layers in casserole. Add 2 tbs. grated onion and 1 hard-boiled egg cut fine. Pour 1 cup soy milk or milk over this and sprinkle top with a few bread crumbs. Bake for $\frac{1}{2}$ hour in moderate oven. Pimiento may be added, and macaroni may be substituted for spaghetti.

SOY MACARONI AND CHEESE

- | | |
|--------------------------------|---------------------------------|
| 1 pkg. soy macaroni | 1 cup white sauce |
| 1 cup grated or chopped cheese | Melba toast crumbs or soy grits |

Cook macaroni in salted water. Drain. Layer in casserole and top each layer with chopped or grated cheese. Cover with white sauce, top with Melba toast crumbs or soy grits and bake 20 to 30 minutes.

QUICK SOY SPAGHETTI

1 pkg. soy spaghetti Minced parsley
1 can tomato soup

Cook soy spaghetti in salted water until tender. Drain. Add to hot undiluted tomato soup. Sprinkle with minced parsley and serve at once. Tomato sauce may be used instead of soup.

MEATLESS CREOLE SPAGHETTI

1 pkg. soy spaghetti 1 medium-sized can meat substitute
2 cups stewed or canned tomatoes 1 medium-sized green pepper 1 medium-sized onion
4 tbs. butter, margarine, or oil Salt and seasoning to taste

Cook spaghetti in salted water and drain. Chop canned meat substitute. Dice onion and pepper and sauté in fat for a few minutes. Add meat substitute and brown. Add tomatoes and spaghetti, cover, and cook 15 to 20 minutes.

SOY MACARONI LOAF

3 cups ground cooked soybeans 3 or 4 tbs. grated onion
1 cup cooked soy macaroni 1 egg
 $\frac{1}{4}$ cup tomato soup or sauce Salt and seasoning as desired

Cook macaroni in salted water and drain. Grind cooked or canned soybeans in food chopper. Beat egg well and add all the ingredients. Mix thoroughly. Bake in oiled loaf pan in moderate oven 40 minutes. Soy grits or soy pulp may be used instead of cooked or canned soybeans.

SOY MACARONI AND CELERY

2 cups cooked soy macaroni 2 tsp. powdered vegetable broth
2 cups cooked celery Other seasoning as desired
 $1\frac{1}{2}$ cups white sauce Toast crumbs

Mix macaroni and celery. Add seasoning and white sauce. Pour into greased casserole, top with crumbs, and bake in moderate oven 20 minutes.

Variations. Add or top with desired amount of grated cheese. Carrots, spinach, and other low-starch vegetables may be used instead of celery.

Lima beans, soybeans, lentils, or peas may be used instead of macaroni.

Brown gravy may be used instead of white sauce.

Soy sauce or meatlike seasonings may also be added.

SAUCES AND GRAVIES

TOMATO SAUCE WITH ONION AND SWEET PEPPER

Grate 1 medium-sized onion on a fine grater. Shred $\frac{1}{2}$ green sweet pepper. Mix in heavy pan, adding 2 tbs. butter or oil, $\frac{1}{2}$ tsp. salt, and 1 tsp. powdered vegetable broth. Cook until slightly brown. Add 1 tbs. meatlike sauce and 1 No. 2 can tomatoes put through sieve. Cover and cook until thick. Diced mushrooms or minced ripe olives are a good addition.

QUICK TOMATO SAUCE

Heat undiluted can of tomato soup. Serve as sauce.

TOMATO SAUCE I

4 large ripe tomatoes peeled	1 tbs. lemon juice
1 tbs. celery salt	4 tbs. finely chopped green
4 tbs. finely chopped parsley	peppers
4 tbs. finely chopped celery	2 tbs. brown sugar or honey

Place all ingredients in covered saucepan and cook slowly until a thick sauce. Stir occasionally to prevent scorching.

TOMATO SAUCE II

1 can stewed tomatoes	2 cloves
1 slice onion	Salt and pepper to taste

Boil 20 minutes, remove from fire, and strain through sieve. Melt 2 tbs. butter or margarine, add 1 tbs. whole-wheat flour, and brown. Add tomato pulp and cook a few minutes.

TOMATO SAUCE III

2 cups stewed or canned tomatoes	1 medium-sized onion grated
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Cook these together 10 minutes. Put through sieve. Melt 4 tbs. butter; add 4 tbs. whole-wheat flour, and salt and seasoning as desired. Add tomato pulp and cook until thick.

MEATLESS GRAVY

2 tbs. butter or vegetable oil	1 cup cold water
2 tbs. whole-wheat flour	Salt and seasoning
1 tsp. or more meat-flavoring paste	

Melt butter, add paste, and blend well; add flour and cook until brown. Add 1 cup cold water, stirring constantly until gravy is smooth and thickened. Add desired salt and seasoning. 1 tsp. powdered vegetable broth gives a delicious flavor.

MUSHROOM GRAVY I

Add $\frac{1}{2}$ cup chopped mushroom pieces to above gravy. This is delicious on meat-substitute loaves.

MUSHROOM SAUCE II

1 small can mushroom soup	1 $\frac{1}{2}$ tsp. flour
1 tbs. butter or margarine	1 tbs. minced parsley

Heat soup. Blend butter and flour; add hot soup to make a cream sauce. Stir constantly. Add minced parsley and serve at once.

VEGETIZED SAUCE

1 tbs. butter	1 tbs. meatlike sauce or 1 tsp.
1 tbs. powdered vegetable broth	paste

Melt butter; add vegetable broth and sauce. Mix well. Add $\frac{1}{4}$ to $\frac{1}{2}$ cup water, stirring constantly. Cook a few minutes. Pour over meat substitute or heat vegetables or soybeans in this sauce. Very good on new potatoes.

MEATLIKE PASTE

This resembles the commercial meatlike pastes and can easily be made at home.

1 cup kitchen yeast (brewer's yeast with beefsteak flavor)	1 tsp. powdered vegetable broth or $\frac{1}{2}$ tsp. celery salt, $\frac{1}{2}$ tsp. onion salt
4 tbs. soy sauce	
$\frac{2}{3}$ cup water	

Mix and cook over low flame, stirring constantly until thick. Pour into small jar, cover, and use as needed.

BASIC WHITE SAUCE

2 tbs. fat	$\frac{1}{4}$ tsp. salt
2 tbs. flour (whole wheat pre-ferred)	1 cup milk

Melt fat in double boiler. Add flour and blend well. Add milk and cook stirring constantly until thick. Cover and cook in double boiler 10 minutes.

Variations. Thin sauce: 1 tbs. fat and 1 tbs. flour to 1 cup milk.

Thick sauce: 4 tbs. fat and flour to cup of milk.

Brown sauce: Brown flour and fat well. Add a small amount of soy sauce or meat-flavoring paste.

Egg sauce: Stir in beaten egg.

Egg sauce: Add 1 chopped hard-boiled egg to white sauce.

Olive sauce: Add 4 tbs. minced ripe olives to sauce.

Parsley sauce: Add desired amount of minced parsley.

BOUILLON GRAVY

2 tbs. fat	1 bouillon cube (beef, chicken, or vegetable)
2 tbs. whole-wheat flour	
1 tbs. minced onion	Seasoning as desired
1 cup water	

Melt fat, add minced onion, and cook a few minutes. Blend in flour. Add bouillon dissolved in water and cook, stirring constantly until thickened. Season as desired.

BROWN EGG GRAVY

4 tbs. margarine, butter or oil	$\frac{1}{4}$ cup browned flour
1 egg beaten to a foam	2 cups milk
$\frac{1}{2}$ tsp. salt	

Put fat in skillet. When fairly hot add beaten egg. Stir constantly until egg particles are browned. Add the browned flour and stir until smooth. Gradually add the milk stirring constantly. Add salt and other seasoning if desired. Bring to boiling point and serve.

SOUPS

Soy soups may be made from the whole beans, ground or mashed beans, soy grits, soy flour, soy milk, and soy milk powder. If possible, cook soups made with dried beans in the pressure cooker. Soaked and ground dried beans may be used for long-cooking soups and if partly cooked may be added to vegetable soups. Soy grits and flour can be added just before serving and are a quick way to add protein to any soup. The grits, being almost starchless, are preferred to rice and barley for the low-starch diet. Soy milk can be used for any cream soup, and soy milk powder or the low fat flour can be mixed with water and used in place of the liquid soy milk. Smooth cream and purée soups are quickly made in a liquefier, and fortunate is the cook who owns one.

SOY ONION SOUP

1 cup dry soybeans	1 tbs. soy sauce
3 onions	1 tbs. powdered vegetable broth
$\frac{1}{2}$ tsp. salt	

Wash and soak beans overnight. Quarter onions, add to soaked beans with 1 cup water and seasoning and cook in pressure cooker 1 hour. Run through sieve. Add water as desired for thick or thin soup. Add seasoning to taste. Celery or a mixture of celery and onions may be used in place of onions.

SOYBEAN SOUP

1 cup dry soybeans	2 cups stewed or canned tomatoes
6 cups water	2 carrots
Ham or soupbone	1 cup chopped celery
2 onions	Seasoning as desired

Wash and soak beans overnight. Cook with ham or soupbone in pressure cooker 30 minutes. Add more water, vegetables, and seasoning, and cook until done. Remove bone and run through liquefier or through sieve. Reheat and serve.

For ordinary pan cooking, soak beans and grind in food chopper. Cook with ham or soupbone 3 or more hours. Add vegetables and simmer until done.

Mashed canned soybeans can be used. They should be added when vegetables are almost done.

Soy grits may also be used.

PURÉE OF SOY SOUP

Mashed soybeans may be added to milk or vegetable stock. Press 1 cup of cooked or canned soybeans through a sieve. Make a sauce of 1 tbs. whole-wheat flour, $2\frac{1}{2}$ cups milk, 1 tbs. butter, 1 tsp. vegetable salt, and 1 tbs. powdered vegetable broth. Add mashed soybeans and 3 cups of hot water to sauce. Serve with whole-grain or soy crackers.

VEGETABLE SOY SOUP

Cook 1 cup of diced carrots and 1 small stalk of chopped celery in 1 qt. of salted water until very tender. When done, add 1 cup mashed soybeans and 1 tbs. powdered vegetable broth. Run through sieve. Serve hot with minced parsley.

PURÉE OF SOYBEAN SOUP

1 cup soybean pulp or mashed beans	1 cup meat stock
	$2\frac{1}{2}$ cups milk
2 tbs. minced onions	1 tbs. whole-wheat flour
4 tbs. minced celery	1 tsp. salt

Cook celery, onion, and mashed beans in soup stock. Thicken with flour; add milk and seasoning to taste. This soup may be run through liquefier and may be made with soy grits instead of mashed beans or pulp.

CREAM OF SOY SOUP

Mash or sieve 1 can or 2 cups of cooked soybeans. Add to this 3 cups of milk and a little salt. Serve hot, topped with minced parsley.

QUICK SOY SOUP

3 bouillon cubes (beef, chicken, or vegetable)	1 cup mashed cooked or canned soybeans
3 cups water	Seasoning as desired

Pour boiling water over bouillon cubes; add mashed soybeans and desired seasoning. Part milk and part water may be used. Serves 3.

SOY GRIT SOUP

Follow favorite pea or lentil soup recipe, using tenderized or quick-cooking soybeans or soy grits instead of peas or lentils.

A small amount of soy grits may be added to any soup a few minutes before serving.

SOY GRIT VEGETABLE SOUP—MEATLESS

1 qt. water	1 medium onion, chopped
$\frac{1}{2}$ cup shelled peas	1 tsp. salt
1 cup chopped celery	2 tsp. powdered vegetable broth
$\frac{1}{2}$ cup grated carrots	Other seasoning as desired
$\frac{1}{2}$ cup diced turnips	

Add vegetables to water and cook until tender. When done, add 2 or 3 tbs. soy grits and cook 5 minutes. A small amount of soy sauce or meatlike seasoning may be added.

GENERAL SOUP RULE—U.S. DEPARTMENT OF AGRICULTURE

To add soy flour to meat or vegetable soups: Use $\frac{1}{4}$ cup soy flour to each quart, or 4 cups, soup. Blend flour with an equal amount of stock and add to soup for a few minutes' cooking before serving.

CREAM OF TOMATO SOUP

Add desired amount of medium soy grits or puffed grits to cream of tomato soup just before serving. Puffed soy grits can be used as croutons.

CREAM OF PEA SOUP

Put 1 can green peas through a sieve; add $1\frac{1}{2}$ cups soy milk or 1 cup soy milk and $\frac{1}{2}$ cup cream. Salt to taste. Serve hot with croutons.

SOY CREAM OF TOMATO SOUP

1 can tomato juice	$\frac{1}{2}$ can soy milk
Pinch soda	1 tbs. butter if desired

Pour tomato juice in saucepan and heat with soda. Heat milk in double boiler. Gradually add hot tomato juice to soy milk, stirring constantly. Add butter and serve. Concentrated soups may be used in place of juice.

CREAMED CHICKEN OR FISH SOUPS WITH SOY-MILK POWDER

2 tbs. butter, margarine, or oil 2 cups water or soup stock
 2 tbs. whole-wheat flour Seasoning as desired
 2 tbs. soy milk powder

Blend milk powder and water, making soy milk. Melt butter or margarine, add flour, and blend well. Add soy milk and seasoning and cook a few minutes. Add a small amount of diced chicken or fish.

DR. DEKLEINE'S VICTORY SOUP

20 tsp. brewer's yeast powder $\frac{1}{2}$ lb. soybean milk powder or
 $\frac{1}{2}$ lb. powdered skim milk soy flour

Mix all together and store in covered jar.

For soup, use $\frac{1}{3}$ cup to each pint of liquid, stock, milk, bouillon, or canned soup. The yeast is rich in the B vitamins. The milk and flour are rich in protein and minerals. The kitchen style, or brewer's, yeast with beef or meatlike flavor is the most palatable. For more vitamin B₁, use the high-potency yeast, which contains 200 international units of vitamin B₁ per gram.

SALADS

The cook's ingenuity and imagination can run riot with salads, and soybeans lend themselves to almost every combination. Whole canned or cooked beans can be used in vegetable and molded salads (see page 186), soy sprouts can be used cooked or raw (see page 195), and roasted beans are good substitutes for nuts. Ground roasted soys make excellent toppings for fruit salads. Soy cheese can be used as cottage cheese (see cheese recipes, page 244), and diced canned soy roasts and loaves are excellent as meat or fish in salads.

PLAIN SOY SALAD

Mix 2 cups of cooked soybeans with 1 cup of chopped celery. Serve on lettuce with French dressing.

SOY BEET SALAD

2 cups cooked and well-drained 1 cup diced celery
 diced beets 2 cups or 1 can plain soybeans

Mix well. Moisten with plain sour cream. Serve in large bowl, decorate with water cress, and add a dash of French dressing.

SOYBEAN VEGETABLE SALAD

1 can of soybeans. Drain beans, add 1 cup chopped celery, 1 cup cooked diced or shoestring carrots, $\frac{1}{2}$ cup diced cucumbers, and a small amount of water cress. Mix well, moisten with French dressing, and place in lettuce-lined salad dish. Decorate with sliced tomatoes.

SOY VEGETABLE PLATTER

Mix 2 cups of cooked soybeans with 1 cup chopped celery, 1 cup diced cucumber, and $\frac{1}{2}$ cup sliced radishes. Moisten with French dressing and place in a mound in the center of a large lettuce-lined platter. Surround edge with asparagus tips and sliced tomatoes. Add sprays of water cress and ripe or green olive olives.

MOLDED SOY SALAD

1 pkg. lime- or lemon-flavored gelatin	1 cup diced cucumber or finely shredded cabbage
1 cup mashed soybeans	$\frac{1}{4}$ cup minced water cress

Dissolve gelatin and cool. Then add beans, cucumber, or cabbage and water cress. Chill until firm. Cut in slices and serve on lettuce with French dressing.

WALDORF SALAD

2 cups chopped apple	1 cup chopped or coarsely ground soy nuts (roasted soybeans)
2 cups chopped celery	Mayonnaise or cooked dressing

Mix apple, celery, and soy nuts. Moisten with desired amount of dressing. Serve on crisp lettuce; decorate with a mint leaf or a sprig of water cress.

SOY FRUIT SALAD

$\frac{1}{2}$ cup raisins	$\frac{1}{2}$ cup chopped celery
1 cup chopped apple	1 medium-sized diced avocado
1 cup green or cooked or canned soybeans	Mayonnaise or cooked dressing

Mix all together and serve on crisp lettuce.

MOCK CHICKEN SALAD

2 cups chopped celery	1 medium-sized can soy roast or loaf
1 cup diced cucumber	
3 cubed tomatoes	Lettuce or water cress
	Mayonnaise or cooked dressing

Remove soy roast or loaf from can and dice. Mix all ingredients together; add desired seasoning and dressing. Serve on crisp lettuce; decorate with wedges of tomato, water cress, and ripe olives.

MOCK TUNA SALAD

1 can tiny peas	Lettuce
1 cup celery	Seasoning
1 cup finely grated carrots	French dressing
4 tomatoes, cut in wedges	Avocado
1 medium-sized can light-colored soy meat substitute	

Remove soy meat substitute from can and shred. Mix with rest of ingredients; add seasoning and French dressing. Serve in lettuce-lined salad bowl. Decorate with strips of avocado and dot with French dressing. Avocado may be diced and added to salad.

DRESSINGS

Soy oil may be used for any salad dressing. Follow favorite recipe, substituting soy oil for other oil. Dressings may also be made from soy spreads.

THOUSAND ISLAND DRESSING

A dressing resembling Thousand Island can be made by thinning canned soy spread with tomato juice. Remove from can or jar, mash, and gradually add tomato juice, soup, or sauce to the desired thinness. Minced ripe olives, peppers, and pimiento may be added as well as minced hard-boiled eggs and minced vegetables. Dressings of this kind can be made to suit the individual taste and prove valuable in diets in which oil cannot be used.

SOY-CHEESE DRESSING

Soy cheese may also be made into a dressing by thinning it with tomato sauce. Add desired seasoning.

TOASTED SOY BUTTER DRESSING

Thin 4 tbs. of toasted soy butter with tomato juice. Beat until smooth. Add the juice of $\frac{1}{2}$ lemon and any seasoning that is desired with 2 tbs. of minced ripe olives, 2 tbs. finely minced celery, and a small amount of minced water cress. Serve on head lettuce.

EGGLESS MAYONNAISE

2 tbs. of soy flour	3 to 4 tbs. of water
1 cup vegetable oil	Salt
Juice of $\frac{1}{2}$ lemon	Seasoning

Mix flour and water, and cook until thick and smooth. Gradually beat in oil. When thick, add salt, desired seasoning, and the lemon juice. In this, the soy flour acts as egg with the oil. It should be made in small quantities and used right away, because it does not keep.

SOUR-CREAM DRESSING

1 cup thick sour cream	2 tbs. French dressing
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Mix well and serve on raw or cooked vegetable salad. Minced ripe olives, minced chives, parsley, or water cress may be added.

YOGHURT DRESSING

Yoghurt, or thick cultured milk, can be used as sour cream for both vegetable and fruit salads. Use plain or flavor with a small amount of lemon juice or French dressing.

BOILED SALAD DRESSING

2 eggs	$\frac{2}{3}$ cup soy milk
4 tbs. soy flour	4 tbs. butter
4 tbs. brown sugar	$\frac{1}{2}$ cup lemon juice
2 tsp. vegetable salt	3 tsp. powdered vegetable broth
2 tsp. dry mustard	

Beat eggs slightly in top of double boiler. Add combined dry ingredients; mix well. Add soy milk. Cook over rapidly boiling water until mixture thickens, about 10 minutes, stirring

constantly. Remove from heat. Add butter and lemon juice gradually. Chill. Makes about 1 pt. dressing. Butter may be omitted if no fat is desired.

HONEY SOY OIL DRESSING

6 tbs. lemon juice	1 tbs. honey
3 tbs. soy oil	Salt to taste

Mix thoroughly and serve on green salad.

HONEY FRENCH DRESSING

1 cup olive or soy oil	1 cup honey
1 cup spiced tomato sauce	1 tsp. salt
1 cup lemon juice	Dash of paprika

Blend in liquefier or mixer or pour into large jar and shake well. Can be used on either fruit or vegetable salads.

SOY SPREADS

Soy spreads have been on the market for many years, but so far their sale has been limited to health-food stores. Vegetarians have used them for sandwiches and as cold cuts. Some spreads contain only soybeans, and others are a combination of soy, nuts, and grains. Some are highly seasoned to resemble bologna, and others are very mild in flavor. Often minced ripe olives or pimiento are added. A few spreads are made from the soy cheese, but most of them contain the bean pulp or the soy grits. Such spreads are easily made at home and can be seasoned to suit the family taste. Mashed soybeans can also be used as sandwich spreads.

SOY OLIVE SPREAD

1 cup cooked grits, as dry as possible	2 tsp. soy or meatlike sauce
	$\frac{1}{2}$ cup minced ripe olives
1 tbs. powdered vegetable broth	Tomato juice or sauce to moisten
$\frac{1}{4}$ tsp. salt	

Cook grits in 2 cups of boiling water. Cook until dry. Add seasoning. Celery and onion salt may be substituted for vegetable broth. Add ripe olives and just enough tomato juice or sauce to moisten. This spread will keep for several days in the refrigerator. It may also be made into patties or meat balls

and browned in fat. This way they may be used as cold cuts in sandwiches.

SOY CHEESE SPREAD

Canned soy cheese may be used as a sandwich spread either plain or mixed with peanut butter, minced olives, and so forth.

STUFFED CELERY

Fill strips of celery with canned soy spread. Chill before serving.

EGG AND SOY SPREAD

2 hard-boiled egg yolks	Salt, lemon juice, mayonnaise to
$\frac{1}{2}$ cup canned soy cheese	taste

Rub egg yolks through sieve, mix with soy cheese, season as desired. This is very good as a sandwich filling with lettuce.

SOY VEGETABLE SPREAD

1 cup mashed soybeans (canned or cooked)	$\frac{1}{2}$ cup finely minced celery
	2 tbs. minced parsley
1 tsp. powdered vegetable broth	

Mash soybeans; add powdered vegetable broth and minced vegetables. Moisten with desired amount of mayonnaise and use as sandwich spread.

SOY AVOCADO SPREAD

Mix equal parts of soy spread with mashed avocado. Usually extra seasoning is not necessary. Minced olives, pimienta, or minced vegetables may be added.

SOY NUT SPREAD

4 tbs. soy butter	1 tbs. mayonnaise or cooked
3 tbs. minced sweet pickles	salad dressing
3 tbs. lemon juice	

Mix well. Prepared soy spread may be used instead of soy butter.

SOY AVOCADO NUT SPREAD

1 medium-sized mashed avocado	2 tbs. or more lemon juice
$\frac{1}{2}$ cup mashed soybeans	Seasoning to taste
$\frac{1}{2}$ cup nut meal (finely ground nuts)	

Peel and mash avocado, add mashed cooked or canned beans and finely ground nuts. Mix well. Add lemon juice and seasoning to taste.

SOY MILK

Soy milk, a white or creamy emulsion, resembles cow's milk in both appearance and consistency. It can be made at home from the dry bean and from the meal or flour. Soy milk is now sold in cans as condensed milk and can be used in every way like ordinary milk. The canned milk is fortified with minerals, fat, and carbohydrate to equal cow's milk and even mother's milk in food value. Powdered soy milk is also available and can instantly be made into liquid milk by the addition of water. Some powdered soy milks have been fortified for extra food value (see Chap. V, page 83). Soy milk has proved a valuable food in allergy and special diets (see Chap. VII, page 125).

SOY MILK MADE FROM DRY BEANS

Oriental Method. There are several Oriental methods for making soy milk from dry beans. The following is perhaps the most simple:

Soak the beans in water for 12 hours at room temperature, changing the water frequently. Grind the beans to a fine paste, preferably in a stone mill, adding water to the mass during the grinding process to the amount of three times the bulk of the beans. Boil this mass to foaming for 1 hour. Strain through cheesecloth. The beans may be ground in a food chopper with a fine knife. Many persons prefer to soak the beans at least 24 hours.

Bag Method. Wash dry beans and soak overnight. In the morning, drain and remove loose skins. Grind the beans very fine and place ground beans in a cheesecloth bag. Place bag in a large bowl of lukewarm water, using 3 qt. of water to each pound of dry beans. Work thoroughly with hands for 5 to 10 minutes. Wring the bag of pulp until dry. Boil the milk on a low flame for 30 minutes, stirring constantly to prevent scorching. Add salt and a small amount of honey or sweetening. This milk will keep several days in a refrigerator.

Quick Method. This method is less work and gives a good soy milk. Soak 1 cup of dry beans overnight. Drain and run

through food chopper, using fine knife. Add 6 cups of water to ground beans and bring to boil. Simmer for 15 minutes; strain through fine sieve or cheesecloth. Flavor as desired.

SOYBEAN MILK—MADISON COLLEGE

lb. dry soybeans

1 cup soy, corn, or cottonseed oil

cups dextrose

3 tsp. salt

Soak the soybeans in water overnight and have the beans well covered. Grind finely on a small grinder. Pour in the grinder a small, continuous stream of water to prevent clogging. Add water until the volume of the ground mixture is 1 gal. Heat in a large pan, preferably enamel, with continuous stirring to 131° or too hot for the finger to remain immersed in it. Place in cheesecloth or a flour sack, using hands to squeeze out the milk. Boil in enamel pan for 45 minutes, stirring constantly. Take 2 cups of the hot milk and pour into a liquefier. Add the oil, and whizz for 5 minutes. An electric mixer or egg beater can be used in the place of the liquefier, but the results are not so satisfactory, and a longer time is required to obtain a good emulsion. Pour the oil-milk mix into the remainder of the milk and stir. Add salt and dextrose. If dextrose is not available, use Karo, honey, or some other form of sugar, and sweeten to taste. Boil for 15 minutes. Add water enough to make 5 qt., and cool quickly. Keep in glass jars or bottles, tightly covered and well refrigerated.

Soybean milk will sour like cow's milk; if putrefaction does not set in, the curd may be boiled and strained like cottage cheese. Season with a pinch of salt, tomato juice, celery salt, or a little onion juice and soy sauce. This is called soy cheese.

SOY MILK FROM SOY FLOUR

1 cup soy flour

4 cups of water

Mix water and flour gradually so that it is not lumpy. Let stand 2 hours, then cook in double boiler for 20 minutes. Strain through sieve or cheesecloth. Flavor with a small amount of honey and salt.

SOY MILK POWDER

Soy milk in powdered form is ready to use and is the base of many a delicious beverage. It can be added to any liquid—

water, milk, juice, or soup. For plain soy milk, use 1 to 2 tbs. powder to each cup of water. Stir until well blended. If sweetening is desired, add a small amount of honey, molasses, or sugar. For sweetened soy powder, add desired amount of dextrose to dry soy powder. Mix well. Powdered banana and powdered coconut may also be added to soy powder for sweetening and flavor. For chocolate flavor, add desired amount of cocoa.

COOKING WITH SOY MILK

Do not hesitate to use soy milk in any recipe calling for milk. Use it in the same proportions as regular milk.

CARROT SOY MILK

Mix equal parts of canned soy milk with fresh carrot juice. If using the soy powder, add 1 or 2 tbs. powder to each glass of juice. Mix well.

LIQUEFIED SOY MILK DRINKS

Delicious soy milk drinks can be made in a liquefier or in a malted-milk mixer. Add 1 to 2 tbs. soy powder or soy malt to juice or desired liquid.

SOY MILK MOLASSES SHAKE

Add 1 tsp. to 1 tbs. molasses to 1 glass of soy milk. Shake well.

SOY CREAM SAUCE

1 tbs. butter or oil	1 cup soy milk
1 tbs. whole-wheat flour	Salt as desired

Mix flour and butter, adding the milk gradually, and cook until smooth. This makes a thin sauce. For a medium sauce, use 2 tbs. of whole-wheat flour.

RICE WITH SOY MILK

$\frac{1}{2}$ cup brown rice	$\frac{1}{4}$ cup raisins
2 cups soy milk	$\frac{1}{2}$ tsp. salt
4 tbs. honey	1 tsp. cinnamon
2 tbs. butter	

Wash rice, add to soy milk, and cook over flame until the rice begins to boil. Then add honey, raisins, salt, and cinnamon. Cook in a double boiler until milk is absorbed and rice is done.

SOY CUSTARD

$\frac{1}{2}$ tsp. salt
2 tbs. molasses

1 15-oz. can of soy milk
2 eggs

Beat eggs slightly; add milk, salt, and molasses. Stir well. Pour into small baking dish or casserole and sprinkle top with cinnamon. Set in a pan of hot water. Bake in 325° oven for about 1 hour or until a silver knife inserted in the custard comes out clean. For chocolate-flavored custard, use chocolate soy milk.

CREAM OF PEA SOUP

Press 1 can of green peas through a sieve; add 1 $\frac{1}{2}$ cups of soy milk or 1 cup soy milk and $\frac{1}{2}$ cup cream. Salt to taste. Serve hot with croutons.

SOY CREAM OF TOMATO SOUP

1 can tomato juice
Pinch soda

$\frac{1}{2}$ can soy milk
1 tbs. butter if desired

Pour tomato juice in saucepan and heat with soda. Heat milk in double boiler. Gradually add hot tomato juice to soy milk, stirring constantly. Add butter and serve. Concentrated soups may be used in place of juice.

TOFU, OR SOY CHEESE

The "meat without a bone" is perhaps the most unusual and to many the most fascinating of all soybean foods (see Chap. V, page 86). By all means try it in a Chinese restaurant. Properly prepared, it is delicious, and Chinese cooks really know how to cook and season tofu.

The fresh cheese may be made at home and may be purchased in sections of the country with a high Chinese population. A few concerns can it for the retail trade.

SOY CHEESE FROM SOY MILK

Soy cheese is made by allowing soy milk to sour and curdle. When it is made commercially, lactic, tartaric, or citric acid is

used; but they are not necessary when a small amount is made at home. Set the soy milk in a warm place to sour and thicken. When thick, cut it into chunks with knife, place in pan, and bring to boiling point. Strain through cheesecloth, wringing the curds as dry as possible. Season with salt and a small amount of soy sauce. The fresh cheese can be used as cottage cheese and can be stored in the refrigerator for several days.

FRESH TOFU

Fresh tofu can be purchased in many Chinese markets. It is a white tasteless cake that definitely needs peppering up as to flavor. Vegetarians use it as meat, fish, cheese, sandwich spread, or dessert. Mashed and seasoned, it resembles cottage cheese; sliced and cooked, it becomes a meat or fish entree; and, sweetened, it can be used as dessert.

TOFU STEAK

Place a cake of fresh tofu in a steamer with a flat solid bottom and holes at the top. Steam 30 minutes. If a steamer is not available, the cake may be cooked on a rack in a small amount of water or tied in a cheesecloth and cooked in water for 20 to 30 minutes. Tofu varies as to firmness depending on method of preparation. The soft cakes require careful handling. When cooking, it is always advisable to place the cake on a rack, for the flat surface against the pan has a tendency to burn.

When cooked, slice cake into $\frac{1}{2}$ - to 1-in. slices. Place in greased baking pan, sprinkle with salt, top with $\frac{1}{2}$ tsp. or more soy sauce or other meatlike sauce. The sauce will penetrate the tofu and give it a decided meatlike flavor. Dot each slice with butter or margarine and brown in hot oven or under broiler. Serve hot. If there is no objection to fried food, the slices may be seasoned with salt and soy sauce and fried in fat, or dipped in crumbs or flour and then fried. Serve with gravy or tomato sauce. Cooked tofu is tasty when cold and can be used as fried meat or eggs for sandwiches.

TOFU IN GRAVY

Cube cake or cakes of fresh tofu. Add to rich meat or meatless gravy and simmer 10 to 12 minutes. Serve like any meat stew. Excellent when onions and other vegetables are added.

TOFU AND POT ROAST

Remove meat from gravy. Add large cubes of fresh tofu. Cook for 10 minutes. Serve with meat and gravy.

MOCK FISH TOFU

Cut fresh tofu into $\frac{1}{2}$ -in. slices. Place in shallow baking pan. Sprinkle with salt and cover with tomato juice, soup, or sauce. Bake 30 minutes. Add butter or margarine before serving. Meatlike flavoring may be added if desired. Arrange baked slices on platter, top with tomato gravy, and sprinkle with minced parsley.

SCRAMBLED TOFU

Melt 2 tbs. butter in a heavy pan. Add 1 cake of fresh tofu cut into small pieces. Season with salt and add 1 tbs. soy sauce. Cover tightly and cook 10 or 15 minutes. Stir occasionally so that it will not stick to the pan. When brown, serve like scrambled eggs. Delicious when prepared with bacon.

SOY CHEESE CUTLETS

Cut cake of fresh tofu in half lengthwise, then crosswise into $\frac{1}{2}$ -in. slices. Dip in beaten egg seasoned with celery salt. Dip in crumbs and fry in a small amount of fat until brown. Slices may be placed in well-greased pan and baked until slightly brown. Serve with tomato sauce.

TOFU CHOP SUEY

3 cups diced tofu	1 cup water
4 tbs. butter or margarine	2 tbs. soy flour
1½ cup shredded onion	1½ cup bean sprouts
1½ cup chopped celery	3 tbs. soy sauce

Brown tofu in butter or margarine. Add partly cooked onions, celery, soy sauce, and water. Cook 5 minutes. Mix soy flour with a small amount of the liquid and add to mixture. Cook a few minutes longer. Add bean sprouts, cover, and cook 5 minutes.

TOFU IN SOUP

Steamed strips or pieces of tofu may be added to any soup in place of noodles. Cook the tofu and add to hot soup before serving.

TOFU SANDWICH SPREAD

Mash raw or cooked tofu, add desired amount of salt, powdered vegetable broth, and other seasoning. Mix well and use as sandwich spread on bread or crackers. Minced chives, ripe olives, or pimiento are good additions.

FRESH TOFU IN DESSERTS

Fresh tofu can be sweetened and flavored and used as a dessert or a topping for desserts. Mash the raw tofu until it is soft and fluffy. Sweeten with desired amount of honey, molasses, or sugar. Flavor with vanilla or cinnamon. Chill and serve in sherbet glasses. This may be used as a topping on baked apples, stewed or canned fruits, or shortcakes.

COCONUT TOFU

1 cup raw mashed tofu	4 tbs. honey
1 cup grated fresh coconut	1 tsp. vanilla

Mix all together, chill, and serve.

CANNED TOFU OR SOY CHEESE

A few concerns can soy cheese under the name soy cheese, soy food, soy curd, or their own trade name. When canned, it is in fine curds resembling the farmer-style cottage cheese. It may be plain, seasoned with soy sauce or spiced or with pimiento. Often it is rather moist. Canned soy cheese can be used like cottage cheese for spreads and salads, or it may be sliced and heated and served as a meat substitute.

SOY CHEESE STEAK

Open both ends of a can of soy cheese. Remove as cylinder. Slice in $\frac{1}{2}$ -in. slices. Brown in butter and serve with minced parsley.

SOY CHEESE FRITTERS FOR TWO

These are delicious and make a very inexpensive meat substitute.

1 egg	1 tsp. soy sauce
1 5-oz. can of soy cheese	

Beat egg well. Add soy cheese and mix until well blended. Add soy sauce. Bake as pancakes in butter. Brown on one side and then turn. They will be tender and yet will not break. Serve hot with butter and tart jelly.

SOY CHEESE CROQUETTES

1 cup canned soy cheese	1 egg
Salt, sage, and grated onion to taste	2 hard-boiled eggs rubbed through sieve
$\frac{1}{2}$ tsp. meatlike paste	2 tbs. melted butter

Beat egg well, add rest of ingredients, mix, and shape into croquettes. Roll in cracker crumbs or corn meal, place in greased pan, and bake in moderate oven 20 minutes. Serve with minced parsley and sliced tomatoes. Croquettes may be made with fresh cheese and may be fried in fat if so desired.

SOY SHEPHERD'S PIE

2 tbs. butter or fat	1 tsp. powdered vegetable broth
1 large onion, diced	2 tbs. flour
1 tbs. meatlike paste	1 14-oz. can soy cheese
$1\frac{1}{2}$ cups water	1 tbs. minced parsley
$\frac{1}{4}$ tsp. salt	Mashed potatoes

Brown diced onion in fat; add water, meatlike paste, and seasoning. Thicken with flour rubbed smooth with a little cold water. Add soy cheese and minced parsley. Place in greased casserole and top with mashed potatoes. Bake until light brown.

SCALLOPED SOY CHEESE AND ONIONS

Place a layer of sliced onions in a buttered casserole; cover with a layer of canned soy cheese and a few bread crumbs. Alternate onions and cheese until casserole is full. Add a small amount of cream or soy milk, and top with bread crumbs. Cover and bake in a moderate oven until done. This is delicious seasoned with soy sauce.

RICE SOY CHEESE CASSEROLE

Season 2 cups of cooked brown rice with salt and powdered vegetable broth. Place a layer of rice in a casserole, cover with a

layer of canned soy cheese, and top with more rice. Fill casserole and add enough milk to almost cover the top. Sprinkle with bread crumbs. Cover and bake 1 hour in a moderate oven.

STUFFED PEPPER AND SOY CHEESE

Fill green-pepper shells with canned soy cheese to which a few chopped ripe olives and a small amount of diced celery have been added. Top with a bit of butter and bake $\frac{3}{4}$ hour in a moderate oven. Serve with tomato sauce.

SOY CHEESE STUFFED POTATO

Cut baked potatoes in half. Remove center and mash. Add $\frac{1}{3}$ the amount of canned soy cheese, a little butter, powdered vegetable broth, and salt. Moisten with cream. Pack into shell and bake until brown on top.

MOCK GIBLET GRAVY

Add $\frac{1}{2}$ cup or 1 small can of diced soy cheese to any brown gravy. Serve hot with meat-substitute dishes or cooked vegetables.

POTATO SOY CHEESE SALAD

2 cups chopped boiled potatoes	1 large diced cucumber
1 cup or can soy cheese	1 tsp. vegetable broth
$\frac{1}{2}$ cup chopped celery	Mayonnaise

Mix potatoes, cheese, celery, and cucumbers with mayonnaise. Serve on lettuce-lined salad platter and decorate with radish roses.

STUFFED TOMATO SALAD

Fill whole scooped-out tomatoes with canned soy cheese. Serve on a bed of water cress with French dressing.

SOY BUTTER

A butter resembling peanut butter can be made from finely ground soybeans or soy flour. It may be raw or roasted. The raw is deep cream in color, and the roasted is similar in appearance to ordinary peanut butter. The roasted is tastier than the raw. Soy butter may be used like any nut butter, for spreads and in cooking or baking. The flavor is improved by the addi-

tion of a small amount of honey. Thinned soy butter can be used as a salad dressing (see Dressing Recipes, page 233).

Many persons, especially vegetarians, use soy butter, either raw or roasted, in place of meat or other animal protein. It contains from 40 to 50 per cent of protein; and since oil is added, it is very rich in fat. Soy butter is a rich concentrated food and should be used as such.

RAW SOY BUTTER

This butter is usually made from finely ground soy meal or soy flour. The flour makes the smoothest butter. Oil is beaten into the flour until the mixture becomes the consistency of peanut butter. The secret of a smooth butter is to beat the mixture with a power beater. For home preparation, place 1 cup soy flour in a bowl and add enough oil to make a spread that does not run. Beat thoroughly. Salt may be added if desired. A small amount of honey improves the flavor, and most soy butters on the market contain honey. Many persons, however, prefer the plain butter, which also can be purchased.

ROASTED SOY BUTTER

Roasted soy butter is made from the roasted beans that have been ground into a fine flour. Browned soy flour may be used if necessary. Oil is gradually beaten in until the mixture is the consistency of peanut butter. The darkness in color depends on how well the beans are roasted. Salt may or may not be added.

CRUNCHY SOY BUTTER

Make raw or roasted soy butter in the usual manner, adding a little more oil. When well blended, add the desired amount of finely ground roasted soybeans. Do not add salt. The roasted beans are salty.

SOY BUTTER AND HONEY

8 tbs. roasted or raw soy butter 4 tbs. honey

Mix well. Use like peanut-butter spread.

SOY BUTTER AND MINCED RIPE OLIVES

½ cup roasted soy butter 3 tbs. minced ripe olives

Mix well and use as sandwich spread.

SOY BUTTER AND CELERY

Stuff small celery stalks with roasted soy butter. Serve with salads.

SOY BUTTER AND AVOCADO

Mash one ripe avocado; add desired amount of raw or roasted soy butter. Mix well. Use as spread on whole-wheat bread or crackers or with raw fruit or vegetables.

SOY BUTTER AND APPLES

Soy butter goes very well with raw fruit or raw vegetables. Those not desiring bread may enjoy an apple sandwich. Slice a large unpeeled apple into thin slices. Spread each slice with a small amount of soy butter. Two slices may be placed together with a soy butter filling.

SOY CEREALS

There are any number of excellent to-cook and ready-to-eat soy cereals on the market. Soy grits may be used as 100 per cent soybean mush or cereal. The most popular cereals are those of grains with a small amount of soy meal or soy grits. The starch content, of course, is higher in this type of cereal; and that should be noted for the low-starch diet.

Ready-to-eat soy cereals may be anything from a sweetened all-soy grit to mixtures fortified with only a small amount of soy. Again the most popular are those mixed with grains. Puffed soy grits can be used as a 100 per cent ready-to-eat soy cereal, or they may be added to any other cereal, thus adding extra protein. Most soy cereals are excellent not only as to food value but as to taste. They have a nutlike flavor that enhances palatability. Soy cereals may be eaten with milk or cream, or served with fresh fruit or berries. Many soy cereals may be mixed at home.

MIXED CEREAL

1 lb. steel-cut oats

1 lb. rye grits

1 lb. soy grits

1 lb. cracked whole wheat

Mix all together. Store in jar or tin and use as needed. Cook as whole-wheat cereal, 20 to 30 minutes in three times the amount of salted water.

SOY WHEAT CEREAL

Mix equal parts of fine cracked wheat and soy grits. Cook as whole-wheat cereal.

SOY, WHEAT, AND WHEAT-GERM CEREAL

1 lb. fine cracked wheat 1 lb. fine soy grits
1 lb. wheat germ

Mix all together. Cook 20 minutes in salted water.

SOY WHEAT-GERM CEREAL

1 lb. wheat germ 1 lb. medium or fine soy grits

Mix. Cook in salted water for 5 minutes. Many doctors suggest this combination as a high-protein and low-starch cereal.

WHEATLESS CEREALS

These are used for wheat-allergy diets and may be mixed as the patient desires. A few combinations contain equal parts of Steel-cut oats, soy grits.

Coarse corn meal, soy grits.

Steel-cut oats, corn meal, soy grits.

Rye grits, barley grits, soy grits.

Rye grits, barley grits, steel-cut oats, corn meal, soy grits.

PUFFED SOY GRITS

These resemble puffed grains but are the grits, high in protein and almost starchless. They may be used as a 100 per cent ready-to-eat soy cereal or may be added to other cereals such as corn flakes and puffed wheat. They are good served with fruit and berries. Puffed grits may be used as toppings for casserole dishes and desserts.

VARIED USES FOR SOY CEREALS

Many soy cereals may be added to muffins, hot cakes, waffles, and cookies. They can also be made into puddings. Directions for these dishes are usually given on the packages. Soy cereals can be used to stretch meat loaves and meat dishes.

SOY DESSERTS

Delicious and nutritious desserts can be made from soy bread, soy grits, and soy cereals. Soy-milk desserts are often necessary in allergy diets.

SOY BREAD PUDDING

2 cups soy bread crumbs	1 cup prune juice
1 cup milk	1 cup chopped cooked prunes
1 egg	1 tsp. cinnamon

Pour milk and prune juice over bread crumbs; add beaten egg, prunes, and cinnamon. Bake in buttered casserole 45 minutes. Serve hot or cold.

CARROT FRUIT PUDDING

2 cups cooked mashed carrots	2 tsp. cinnamon
2 cups chopped dates or 1 cup dates, 1 cup raisins	2 eggs
$\frac{1}{4}$ tsp. salt	1 cup apple juice
	2 cups soy cookie crumbs

Beat eggs and add rest of ingredients. Mix well. Bake in buttered casserole 30 minutes in moderate oven. This pudding may be baked in individual custard cups. Serve hot or cold, with cream or custard sauce.

SOY DATE PUDDING

1 cup chopped or ground dates	2 eggs
1 cup soy milk	2 tbs. butter
1 tsp. lemon juice	2 tbs. honey
1 cup soy Melba toast crumbs	Pinch of salt
1 tsp. cinnamon	

Beat eggs; add soy milk, honey, melted butter, crumbs, and flavoring. Mix well. Pour into oiled baking dish and bake 30 minutes in moderate oven. Serve with custard sauce.

SOY APPLE BETTY

2 cups whole-wheat bread crumbs	1 tsp. cinnamon
$\frac{1}{2}$ cup soy grits mixed with $\frac{1}{2}$ cup water	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup brown sugar	4 cups diced apples
	1 tbs. butter

Mix bread crumbs and soaked soy grits. Mix cinnamon, sugar, and salt. Place a layer of the crumb-soy mixture in a greased baking dish or casserole. Top with a layer of diced apple. Sprinkle with sugar mixture. Repeat layers until casserole is full. Top with crumbs, and dot with bits of butter. Cover and bake until apples are soft, about 30 to 45 minutes. Remove cover toward the last of baking and allow crumbs to brown.

SOY CEREAL PUDDING

1 cup leftover cooked soy cereal	2 cups milk
$\frac{1}{2}$ cup brown or white sugar	$\frac{1}{2}$ cup chopped dates or raisins
2 eggs beaten lightly	Nutmeg or cinnamon

Mix thoroughly, pour in greased baking dish, and top with a sprinkling of nutmeg or cinnamon. Bake in moderate oven (350°) 20 minutes. Serve with cream or pudding sauce.

SOY GRIT PUDDING

$\frac{3}{4}$ cup soy grits	1 tsp. cinnamon
$1\frac{1}{2}$ cups water	2 eggs
$\frac{1}{2}$ tsp. salt	1 cup milk
4 tbs. brown sugar	$\frac{1}{2}$ cup seedless raisins
2 tbs. molasses	

Add grits to boiling salted water. Cook 3 to 5 minutes or until dry. Add sugar, molasses, cinnamon, and raisins. Mix well. Beat eggs; add milk and grit mixture. Pour into buttered casserole and bake in 325° oven for 1 hour and 15 minutes. Serve with cream or honey meringue (see following recipe).

HONEY MERINGUE

1 egg white	4 to 6 tbs. honey
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Add honey to unbeaten egg whites. Beat until mixture peaks. The more honey used, the stiffer the meringue is and the better it will hold up. Serve in place of whipped cream.

SOY CUSTARD

2 eggs	2 tbs. molasses
1 cup soy milk	Cinnamon
$\frac{1}{2}$ tsp. salt	

Beat eggs slightly; add milk, salt, and molasses. Stir well. Pour into small baking dish or casserole and sprinkle top with cinnamon. Set in pan of hot water and bake in 325° oven for about 1 hour or until custard is set.

SOY BUTTERSCOTCH PUDDING

4 tbs. brown sugar	$\frac{3}{4}$ cup dark corn sirup
4 tbs. cornstarch	2 egg yolks
$\frac{1}{4}$ tsp. salt	2 tbs. butter
$1\frac{1}{2}$ cups soy milk	

Mix sugar, cornstarch, and salt in saucepan. Gradually add milk, then sirup, and mix well. Cook, stirring constantly until mixture thickens. Beat egg yolks slightly, and blend in cooked mixture a little at a time. Continue cooking for 2 or 3 minutes. Remove from heat, add butter, and pour into individual sauce or dessert dishes.

SOY-ENRICHED CHOCOLATE PUDDING

3 tbs. cornstarch	2 cups milk
4 tbs. sugar	1 tsp. vanilla
2 tbs. soy flour	$\frac{1}{4}$ tsp. salt
3 tbs. cocoa	

Mix cornstarch, cocoa, sugar, soy flour, and salt. Gradually add milk and blend thoroughly. Cook, stirring constantly for 3 or 4 minutes or until mixture is thick. Remove from flame, add vanilla, pour into molds or dessert dishes, and cool. Serve with cream.

SOY PUDDINGS

Soy milk may be used in place of regular milk in any prepared and packaged puddings.

SOY ICE CREAM

Soy milk may be used in place of milk in ice-cream recipes. Follow regular directions, substituting soy milk for milk and adding whipped cream. Part milk and part soy milk may be used if desired.

SOY FRUIT ICE CREAM—CONTAINS NO MILK OR CREAM

1 cup sugar	1 cup soy milk
1 mashed banana	1 cup coconut milk
Juice of 1 orange	Pinch of salt
Juice of 1 lemon	

Mash banana; add sugar, salt, and fruit juice. Blend with soy and coconut milk. Coconut milk may be made from the fresh coconut or from the coconut powder by adding water. Freeze mixture, stirring often while freezing. May be topped with chopped nuts before serving.

SOY CHOCOLATE DESSERT—EGGLESS

2 cups milk	1 tbs. plain gelatin
1 cup grated soy chocolate	

Soak gelatin in 3 tbs. milk. Add grated chocolate to rest of milk and heat in double boiler. Do not boil. Add gelatin and stir until well blended and gelatin is thoroughly dissolved. Pour into individual molds or glasses and chill. Serve with cream.

Variations. For whipped sponge, beat mixture until frothy when starting to congeal.

For icebox dessert, pour a layer of the beaten mixture into a buttered loaf pan. Top layer with vanilla cookies or thin wafers. Add a layer of the whipped gelatin and alternate until pan is full. Chill several hours. Slice to serve.

Soy milk may be used in place of milk. Add 1 tsp. vanilla.

SOY CANDIES

There are several so-called soy chocolates on the market containing soy flour or soy powder. Most of them resemble ordinary milk chocolate and may be used for beverages, candy, baking, and frostings.

DIPPED SOY CHOCOLATE CANDIES

Nuts, dates, or dried fruits may be dipped in soy chocolate. Melt a small amount of chocolate over hot water. When soft, dip fruits or nuts in it and place them on wax paper to harden. Ground dried fruits, such as figs or raisins, may be shaped into balls and dipped. Nut-stuffed dates are delicious when dipped.

Raisins, nuts, or ready-to-eat cereal may be mixed into the melted chocolate and dropped by spoonfuls on wax paper as clusters.

SOY CRUNCHES

Melt a small amount of soy chocolate. Add enough ground, toasted soybeans to take up chocolate and yet stick together. Drop as clusters on wax paper to harden.

SOY DELIGHT

Many stores sell candy on this order, a white or chocolate divinity containing soy flour or soy powder.

2 cups granulated sugar	2 egg whites
$\frac{1}{2}$ cup hot water	$\frac{1}{2}$ tsp. vanilla
$\frac{1}{2}$ cup corn sirup	Pinch of salt
4 tbs. unsweetened powdered soy milk	

Mix sugar, water, and corn sirup, and boil together to the hard-ball stage when tested in cold water. Beat egg whites with pinch of salt until stiff and dry. Pour hot sirup gradually into egg whites, beating all the time. Add powdered soy milk and vanilla and continue beating until stiff. Pour into buttered pan to cool. Cut into squares. Nuts or ground toasted soybeans may be added if desired.

SOY PANOCHA

3 cups brown sugar	2 egg whites
$\frac{1}{2}$ cup corn sirup	4 tbs. powdered soy milk
$\frac{2}{3}$ cup water	1 cup ground toasted soybeans

Boil sugar, corn sirup, and water to a hard ball when tested in cold water. Beat egg whites dry, pour hot sirup in gradually. Add powdered soy milk. Beat constantly until mixture thickens. Add ground toasted soybeans. Shape into balls or pour into buttered pan and cut into squares.

SOY BRITTLE

2 cups granulated sugar	1 cup toasted soybeans
$\frac{1}{4}$ tsp. soda	

Heat sugar in a heavy pan until melted. Add soda as soon as sugar is melted and stir quickly. Care must be taken that sugar does not boil up too quickly after soda is added. Add soybeans and quickly turn into a buttered pan. Soybeans may be spread on a buttered pan and the sugar mixture poured over them.

SOY CHOCOLATE FUDGE

2 cups sugar	1 cup soybean flour
4 tbs. cocoa	1 tbs. corn sirup or honey
$\frac{1}{3}$ cup water	2 tbs. butter
$\frac{1}{3}$ cup milk	1 tsp. vanilla

Blend sugar and cocoa. Mix water and milk with soy flour and add to sugar and cocoa. Mix well. Add sirup and cook to 230° or the medium-soft-ball stage. Stir constantly when cooking. Remove from fire, add butter. Allow mixture to cool, add vanilla, and beat until thick. Pour into buttered pan. When cold cut into squares.

SOY BEVERAGES

COFFEE SUBSTITUTES

When coffee was rationed, the soybean appeared as a coffee extender and substitute. Many persons have been using it this way for years, and most concerns manufacturing a line of soy food products have what is known as soy coffee substitutes. Heavily roasted and ground soybeans look exactly like coffee but of course are different in aroma and flavor. These roasted beans may be used as a beverage by themselves or mixed with dried fruits, grains, chicory, and other products. Some of the 100 per cent soy beverages are in powder form and are instantly made with hot water. Others are ground for the drip or percolating method. Beverages of this kind have become popular with persons desiring a hot, coffeelike drink without stimulating effects. The soybean's popularity as a coffee extender with the general public terminated with coffee rationing, but a certain amount will always be used for coffeelike beverages.

SOY MALT AND OTHER BEVERAGES

These beverages have been on the market for several years and have gained steadily in popularity. As yet, most persons do

not know about them. Soy malts are made from soy powder or low-fat soy flour with malt, sweetening, and flavoring added. The most popular flavors are vanilla and chocolate, though coconut, banana, and almond are available. Soy malts are sold under various trade names.

HOT SOY MALT

Place 1 tbs. of soy malt in a cup. Add enough hot water to make a smooth paste. Fill cup with hot milk. Water may be used, adding cream as desired. A small amount of nutmeg adds flavor to the plain malt.

SOY SHAKE

2 tbs. soy malt	$\frac{1}{2}$ cup cracked ice
1 cup water	1 banana, sliced
1 cup milk	1 or 2 tbs. honey

Pour water into liquefier or mixer. Add soy malt and blend well. Add milk, ice, and sliced banana. Whip until thoroughly blended. Sweeten as desired. Strawberries, peaches, or other fruit may be used in place of banana.

OTHER USES OF SOY MALT

Soy malt can be used for flavoring custards, desserts, ice creams, sauces, candies, cakes, and cookies. It is excellent added to eggnog.

SOY-FLOUR RECIPES

Soy flour is creamy in color, fluffy and fascinating to work with. It is not a flour as are grain flours or potato flour. It is more on the order of powdered milk and powdered eggs in use and in concentration of food value, and it is an easy and economical way of stepping up the protein content of any baked product. Since soy flour does not contain gluten or starch, it cannot be used by itself in ordinary recipes and must be mixed with other flours. A small amount can be added to bread, biscuits, muffins, pancakes and waffles, pastries, cakes, and cookies. Soy-flour bakery products stay fresh longer, toast better, and have a delicate nutlike flavor.

General Rules for Using Soy Flour.

1. A mixture of 2 tbs. of soy flour in every cup of wheat flour can be used in practically every recipe. More soy, even as much as 50 per cent, can be used if desired, especially in muffins, waffles, pancakes, and quick breads. Muffins can be made with all soy flour, but they will not be light and will have a definite soy taste (see page 266). All-soy pancakes can be made with buttermilk or sour milk and soda but require careful baking (see page 267). Sour milk or buttermilk and soda gives excellent results with high percentages of soy flour.

2. Soy browns easily and requires careful baking. Do not have oven too hot. It is always wise to lower oven temperature at least 25° for baking, when adding soy flour to an ordinary recipe.

3. Soy-flour products require a little more salt, flavoring, or spices than do other flour products.

4. A small amount of added water or liquid is usually necessary if a high percentage of soy flour is used.

5. Always sift soy flour before measuring.

BREAD AND MUFFINS

General Rule for Soy Bread. Follow your favorite bread recipe, using 10 to 30 per cent of soy flour. Some cooks prefer to add soy flour first, while others mix the two flours. Either way may be used. One secret of good bread is never to chill the dough. Keep it warm, away from drafts, and keep it covered with a towel. For soft crusts on bread, brush with butter as soon as loaf is removed from oven.

SOY BREAD

2 cups scalded milk	1 yeast cake dissolved in $\frac{1}{2}$ cup
2 rounding tbs. shortening	warm water
$\frac{1}{2}$ cup brown sugar or honey	About 7 cups flour (using $\frac{1}{4}$ soy
1 $\frac{1}{2}$ tsp. salt	flour)

Add shortening, sugar, and salt to scalded milk. Let cool. Add dissolved yeast cake and work in flour to make a stiff dough. Knead well. Let rise. Knead again and shape into loaves. When double in bulk, bake in moderate oven. Care must be taken that crust does not burn, because this bread browns very quickly.

For rolls, add 1 or 2 eggs to above recipe and 1 more tbs. shortening. Follow directions for bread, and bake $\frac{1}{2}$ hour or more in a 325° oven.

OPEN-RECIPE BREAD

This loaf of bread is made according to the open recipe sponsored by the Emergency Food Commission of New York State, and developed by the School of Nutrition at Cornell University, Ithaca, N.Y., a recipe designed to produce a loaf of bread unusually high in nutritive value. It is composed of enriched unbleached wheat flour with added wheat germ, high-fat soy flour, dry skim milk, sugar, yeast, pure lard, salt, and sufficient water to prepare.

If you wish to make this same distinctive, highly nutritious bread at home, simply follow any standard directions for making bread and use these ingredients for a 2-loaf batch:

6 cups sifted enriched, un-	2 cups water
bleached flour with added	3 tsp. salt
wheat germ	$2\frac{1}{2}$ tbs. sugar
1 cake yeast	9 tbs. high-fat soybean flour
$3\frac{1}{2}$ tbs. dry skim milk	tbs. shortening

2 cups fluid milk may be used in place of the dry skim milk and water listed above.

SOY WHOLE-WHEAT BREAD

Break 1 cake fresh yeast into 1 cup lukewarm water. Add $\frac{1}{2}$ tsp. honey and let it stand until it bubbles. Then beat in $\frac{3}{4}$ cup soy flour and $\frac{1}{2}$ cup whole-wheat flour. This will make a soft sponge. Let stand until light. Then add $\frac{1}{2}$ cup lukewarm milk, 1 tsp. salt, 1 tbs. honey, $1\frac{1}{2}$ tbs. melted butter, shortening, or oil. Mix well and add to sponge. Beat in also $\frac{1}{4}$ cup soy flour and $2\frac{1}{4}$ cups whole-wheat flour. This will make a dough stiff enough to knead. Remove to floured board and knead with a light touch. Add whatever flour is necessary so that dough will not stick to hands or board. Shape in ball and place in oiled or buttered deep bowl. Let rise until double. Punch down and let rise again. Shape into loaves. This will make one very large loaf, two small, or one medium and a few

buns. Let rise until almost double. Bake in 325° oven for 1 $\frac{1}{4}$ hours, more if one large loaf. When bread is in the oven, lower flame to 315°.

SOY WHOLE-WHEAT ROLLS

Break 1 cake fresh yeast into $\frac{1}{4}$ cup lukewarm water with 1 tbs. honey. For sweeter rolls, add more honey. Let stand until bubbly, then add 1 tsp. salt, 1 $\frac{1}{4}$ cups lukewarm milk, 2 tbs. butter or oil. Beat in 1 cup whole-wheat pastry flour and 1 cup soy flour. Let rise until light and add about 2 cups whole-wheat pastry flour. Knead and place in oiled bowl. Let rise until double in bulk, punch down, let rise again, and shape into rolls. For high biscuits, make round balls and place close together. For buns, place farther apart. May be made as Parker House rolls, twists, or clover-leaf biscuits. For clover-leaf, place 3 small balls in buttered muffin tin, let stand until double in bulk. Bake in 325° oven for at least 30 minutes. May be made like cinnamon rolls with cinnamon and raisins. Roll into strips, butter inside, sprinkle with cinnamon, add raisins, and coil into biscuit shape. Place close together in buttered pan, let rise, and bake.

SOY COFFEE CAKE

1 yeast cake dissolved in 4 tbs.	$\frac{1}{2}$ tsp. salt
lukewarm water	1 egg
1 cup milk	1 cup soy flour
3 tbs. butter or shortening	3 cups flour
3 tbs. sugar or honey	

Break yeast cake into lukewarm water and let stand a few minutes. Heat milk until lukewarm, pour into mixing bowl, and add butter, sugar, and salt. Stir until butter is melted. Add yeast, $\frac{1}{2}$ cup soy flour, and 1 cup flour. Cover and let mixture stand until it bubbles; then add beaten egg, $\frac{1}{2}$ cup soy flour, and about 2 cups flour. Mix well and knead as for bread. Place dough in oiled bowl and let rise until double in bulk. Remove from bowl and knead slightly. Flatten with rolling pin and shape into loaf about 1 in. thick. Place in well-oiled cake pan, cover, and let rise until double in bulk. Brush top with melted butter,

and top with 3 tbs. of brown or white sugar mixed with 1 tsp. cinnamon. Bake 20 to 30 minutes in a 350° oven.

SOY WHOLE-WHEAT COFFEE CAKE

Follow above recipe using whole-wheat pastry flour instead of white flour. Whole-wheat pastry flour may also be used for cinnamon rolls and fancy twists.

CINNAMON ROLLS

Use same recipe as for coffee cake. Roll out 1 in. thick and top with melted butter, sugar, and cinnamon. A sprinkling of raisins may be added. Roll dough tightly and cut in $\frac{1}{2}$ -in. pieces. Place close together in well-oiled pan and let rise until double. Bake 20 minutes in a 350° oven.

FANCY TWISTS

Use coffee-cake recipe. When dough is double in bulk, knead slightly and break off small portions. Roll thin and shape into coils, figure eights, and so forth. Dip into sugar mixed with cinnamon. Place in oiled pan and let rise until double. Bake 15 to 20 minutes in moderate oven.

REFRIGERATOR ROLLS

1 yeast cake dissolved in 3 tbs. lukewarm water	4 tbs. sugar or honey
$\frac{1}{2}$ cup water	1 egg
$\frac{1}{2}$ cup milk	$\frac{1}{2}$ cup soy flour
6 tbs. shortening	About $3\frac{1}{2}$ cups flour
	1 tsp. salt

Heat water. Add salt, sugar, shortening, and milk. Stir until shortening is melted. Add yeast, well-beaten egg, soy flour, and 1 cup flour. Beat well. Add rest of flour, enough to make a dough stiff enough to knead. Place on floured board and knead several minutes. Place ball of dough in greased bowl, brush with melted fat, cover, and store in refrigerator. For rolls, remove amount of dough desired. Shape into small balls and place in greased baking pan. Cover and let rise until double in bulk. Bake in 400° oven about 15 minutes.

SOY GLUTEN BREAD

- | | |
|--|--------------------|
| 1 yeast cake dissolved in $\frac{1}{4}$ cup lukewarm water | 1 tbs. shortening |
| 1 cup milk and 1 cup water or 2 cups milk | 1 cup gluten flour |
| | 2 cups soy flour |
| | About 3 cups flour |
| 1 tsp. salt | |
| 1 tsp. brown or white sugar (omit for restricted diets) | |

Break yeast cake into $\frac{1}{4}$ cup lukewarm water. Heat 1 cup water, pour into bowl, and add shortening. When melted, add cold milk, salt, sugar, and yeast. Add 1 cup gluten flour, 1 cup soy flour, and 1 cup flour. Beat until smooth and full of air bubbles. Add 1 cup soy flour, and about 2 cups flour or enough to make a stiff dough. Knead thoroughly, adding flour on board until dough does not stick to hands or board. Place in oiled bowl, cover, and let rise until double in bulk. Punch down and let rise again. Remove from bowl and shape into 2 loaves. Place in oiled pans, cover, and let rise until almost double in bulk. Bake in 325° oven for 1 hour.

SOY GLUTEN ROLLS

Follow the above recipe, shaping dough into rolls instead of loaves. Place rolls close together in an oiled pan, cover, and let rise until double in bulk. Bake in moderate oven, 20 to 30 minutes, depending on size. Brush with butter when removed from oven.

SOY MELBA TOAST

Soy Melba toast may be purchased or made at home. An entire loaf may be made at one time, and the toast may be stored in an airtight container. If using unsliced loaf, do not slice too thin. Place slices of soy bread in a slow oven (300 to 325°) and bake until golden brown. Bread will brown quickly. Be sure to have a slow oven and turn slices if necessary to brown evenly.

SOY CINNAMON TOAST

Excellent with tea, and guests will not suspect it is soy. Toast slices of soy bread in toaster or place several slices on broiler rack or in lower oven, and toast until well browned on both

sides. Butter at once and dip in a mixture of brown sugar and cinnamon. Use 4 tbs. sugar to 1 tsp. cinnamon. Cut slices diagonally and serve hot. Toast may be kept in warm oven until ready to serve.

BOSTON BROWN BREAD

1 cup soy flour	2 tsp. salt
1 cup fine corn meal	$\frac{3}{4}$ cup molasses
1 cup whole-wheat flour	2 cups butter or sour milk
2 tsp. soda	$\frac{1}{2}$ cup raisins (optional)

Mix and sift flour, meal, salt, soda; add molasses and milk. Beat well. Place in a covered mold and steam 3 hours.

GINGERBREAD—EGGLESS AND SUGARLESS

1 cup molasses	1 tsp. ginger
$\frac{1}{2}$ cup boiling (or cold) water	1 tsp. soda
cups flour	$\frac{1}{2}$ tsp. salt
cup soy flour	4 tbs. shortening

Sift together salt, soda, and flours. Add water and melted shortening to molasses and pour into dry ingredients. Mix thoroughly. Pour into buttered cake pan and bake in 350° oven for 25 minutes. Boiling water makes a moist gingerbread; cold water makes a dry one.

GINGERBREAD

$\frac{1}{2}$ cup shortening	1 tsp. ginger
$\frac{1}{2}$ cup sugar	$\frac{1}{2}$ tsp. salt
1 cup molasses	$\frac{3}{4}$ cup soy flour
2 eggs	$2\frac{1}{4}$ cups flour
1 cup sour milk or buttermilk	1 tsp. cinnamon
1 tsp. soda	

Cream shortening and sugar. Add molasses and well-beaten eggs and alternate milk with the sifted dry ingredients. Beat well. Bake in an oiled shallow pan in a 350° oven for 35 to 40 minutes.

WHOLE-WHEAT GINGERBREAD

5 tbs. shortening or oil	$\frac{1}{4}$ tsp. salt
$\frac{1}{2}$ cup brown sugar	1 tsp. soda
1 egg	$\frac{1}{2}$ cup sour milk or buttermilk
$\frac{1}{2}$ cup molasses	1 cup whole-wheat pastry flour
1 tsp. ginger	$\frac{3}{4}$ cup soy flour
1 tsp. cinnamon	

Cream shortening and sugar; add well-beaten egg and molasses. Sift dry ingredients together. Add soda to sour milk or buttermilk. Add alternately with flour and spices. Pour into greased pan and bake 40 to 45 minutes in a 350° oven.

SOY GINGER MUFFINS OR BREAD—EGGLESS

$\frac{1}{2}$ cup molasses	$\frac{1}{2}$ tsp. ginger
$\frac{1}{3}$ cup boiling water	$\frac{1}{2}$ tsp. soda
A generous $\frac{3}{4}$ cup soy flour	$\frac{1}{4}$ tsp. salt
$\frac{1}{4}$ cup whole-wheat pastry flour	2 tbs. oil or melted butter

Sift flours, add salt and ginger, and sift again. Add boiling water to molasses, stir in soda, sift in flour, add oil or melted butter, and beat well. Fill oiled muffin tins and bake in 350° oven until brown. For gingerbread, double recipe and bake in oiled shallow pan. For a delicious drop cookie, add soy flour until dough is stiff enough to drop from spoon. Bake on oiled cookie sheet.

NUT BREAD

$\frac{1}{3}$ cup brown sugar	3 tsp. baking powder
1 egg	1 cup milk
$\frac{2}{3}$ cup soy flour	2 tbs. melted fat
$1\frac{1}{2}$ cups flour	$\frac{1}{2}$ to 1 cup nuts
$\frac{1}{2}$ tsp. salt	

Beat egg, add melted fat and milk, and sifted dry ingredients. Stir in nuts. Bake in an oiled loaf pan in a 350° oven for 1 hour or more.

DATE NUT BREAD

1 cup flour	2 tbs. shortening
1 cup soy flour	1 cup chopped dates
1 cup brown sugar	$\frac{1}{2}$ cup nut meats
1 tsp. baking powder	1 cup sour milk or buttermilk
1 tsp. salt	1 tsp. soda

Cream shortening and sugar. Add nut meats and dates, sifted flours, salt, and baking powder. Put soda in buttermilk and add last. Beat. Pour into an oiled loaf pan, let rise $\frac{1}{2}$ hour in a warm place. Bake in slow oven for 1 hour.

FRUIT NUT BREAD

$\frac{1}{2}$ cup brown sugar	$\frac{1}{2}$ cup raisins
2 tbs. shortening	$\frac{1}{2}$ cup nut meats
1 egg	1 tsp. grated orange rind
$\frac{3}{4}$ cup milk	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ tsp. salt	1 $\frac{1}{2}$ cups flour
2 tsp. baking powder	$\frac{1}{2}$ tsp. nutmeg
$\frac{1}{2}$ cup chopped dates	

Sift flours separately. Measure and sift all dry ingredients together. Cream shortening and sugar, add beaten egg, milk, fruit, and nut meats. Mix well; add orange rind and dry ingredients. Beat. Place in well-oiled loaf pan and bake in 350° oven for about 1 hour.

WHOLE-WHEAT NUT BREAD

1 cup soy flour	1 tsp. cinnamon
1 $\frac{1}{2}$ cups whole-wheat pastry flour	1 cup chopped nuts
2 tbs. brown sugar	2 eggs
4 tsp. baking powder	1 cup milk
1 tsp. salt	4 tbs. melted butter or oil

Sift together the dry ingredients and add the nuts. Beat the eggs; add milk and fat. Pour this into the first mixture. Let the dough stand in a well-greased pan for 20 minutes. Bake in a 350° oven for about 1 hour.

CORN BREAD

$\frac{3}{4}$ cup fine yellow corn meal	1 tsp. salt
$\frac{1}{2}$ cup soy flour	1 cup milk
$\frac{1}{2}$ cup flour	1 egg
3 tsp. baking powder	3 tbs. melted shortening or drippings
$\frac{1}{4}$ cup brown sugar	

Sift and mix dry ingredients. Add milk, well-beaten egg, and melted fat. Bake in shallow greased pan in 400° oven 25 or 30 minutes. Serve hot with butter and honey.

SOY CORN BREAD OR MUFFINS—WHEATLESS

1 cup soy flour	2 eggs
1 cup fine yellow corn meal	1 cup thin cream or milk
$\frac{1}{2}$ tsp. salt	1 tbs. melted butter
4 tsp. baking powder	

Beat eggs until very light. Add milk and butter and sift in dry ingredients. Mix well. Fill well-oiled muffin tins or pour in shallow pan. Bake muffins 25 minutes in a 350° oven. For bread, bake 30 to 40 minutes.

BUTTERMILK CORN BREAD—WHEATLESS

1 cup fine corn meal	1 cup buttermilk
1 cup soy flour	4 tbs. molasses
$\frac{1}{2}$ tsp. salt	1 egg
1 tsp. soda	4 tbs. melted shortening

Sift dry ingredients. Add milk, molasses, well-beaten egg, and melted shortening. Beat well. Turn into shallow well-oiled pan and bake 35 minutes or more in moderate oven.

100 PER CENT SOY SPOON BREAD

$\frac{3}{4}$ cup soy flour	1 cup buttermilk
$\frac{1}{4}$ tsp. salt	1 egg, beaten
$\frac{1}{2}$ tsp. soda	1 tbs. melted fat

Sift flour, salt, and soda. Beat egg, add buttermilk and fat, and add this mixture to the dry ingredients. Bake in a well-greased pan in a 350° oven for 50 to 60 minutes. Serve hot with butter.

PLAIN SOY MUFFINS

$\frac{1}{2}$ cup soy flour	$\frac{1}{2}$ tsp. salt
$1\frac{1}{2}$ cups flour	1 egg
4 tsp. baking powder	1 cup milk
4 tbs. brown sugar	4 tbs. melted shortening

Sift all dry ingredients together. Mix the well-beaten egg, shortening, and milk and stir quickly into dry mixture. Bake in small well-greased muffin tins in 350 to 375° oven for 15 to 20 minutes.

SOY WHOLE-WHEAT MUFFINS

1 cup soy flour	4 tsp. baking powder
1 cup whole-wheat pastry flour	1 cup milk
1 tsp. salt	1 tbs. melted fat
2 tbs. brown sugar	1 egg

Sift the dry ingredients together. Mix the milk and beaten egg, add the melted fat, pour into the dry ingredients, and stir until they are just moistened. Pour into well-greased muffin tins and bake in a moderate oven 25 to 30 minutes. These may be made with 1 cup buttermilk or sour milk and 1 tsp. soda.

BRAN MUFFINS

2 tbs. shortening	$\frac{1}{2}$ cup soy flour
3 tbs. brown sugar	$\frac{3}{4}$ cup milk
1 egg	3 tsp. baking powder
1 cup bran	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup white or whole-wheat flour	

Cream shortening and sugar. Add well-beaten egg, bran, and milk. Let stand until bran soaks up most of the moisture. Fold in dry ingredients. Stir only until flours disappear. Bake in 350 to 365° oven about 30 minutes.

WHEAT-GERM MUFFINS

4 tbs. shortening	$\frac{1}{2}$ cup white or whole-wheat flour
3 tbs. brown sugar	$\frac{1}{2}$ cup wheat germ
1 egg	1 cup buttermilk
$\frac{1}{2}$ tsp. salt	1 tsp. soda
1 cup soy flour	

Cream shortening and sugar. Add well-beaten egg, buttermilk, wheat germ, and sifted flours, salt, and soda. Bake in well-greased muffin tins for 25 minutes in a 350° oven.

For variations, add berries, chopped dried fruits, dates, or nuts.

EGGLESS LAXATIVE MUFFINS

1 cup whole-wheat bread or pas- try flour	$\frac{3}{4}$ tsp. soda
1 cup soy flour	2 tbs. whole flaxseed
1 cup bran or wheat germ	2 tbs. honey
$\frac{1}{2}$ tsp. salt	4 tbs. melted butter or oil
2 tsp. baking powder	2 cups buttermilk

Sift dry ingredients into bowl. Add buttermilk and then honey and melted butter or oil. Mix well. Bake in greased muffin tins in 350° oven for 35 minutes.

EGGLESS WHEAT-GERM MUFFINS

cup soy flour	1 tbs. honey
cup whole-wheat pastry flour	$\frac{1}{2}$ tsp. salt
cup wheat germ	$\frac{1}{2}$ tsp. soda
cup buttermilk	1 tbs. oil or melted fat

Mix shortening and honey, add buttermilk, then sifted flours, wheat germ, soda, and salt. Beat well and bake in well-greased muffin tins in moderate oven 35 minutes, or until well done (1 tsp. vanilla or cinnamon may be added for flavoring if desired). This makes 8 medium-sized muffins. Cool before serving.

SOY WHEAT SCONES

$\frac{1}{2}$ cups soy flour	2 eggs
cup whole-wheat flour	3 tsp. baking powder
cup milk	$\frac{1}{2}$ tsp. salt

Beat eggs, add milk, then add sifted flour, salt, and baking powder. Beat well and bake as drop biscuits in a moderate oven until brown. Makes 18 scones. This recipe may be made into drop cookies by adding 3 tbs. honey or chopped dried fruit.

ALL-SOY MUFFINS

1 egg	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup buttermilk	$\frac{1}{2}$ tsp. soda
1 tbs. shortening	1 cup soy flour
1 tbs. molasses	

Beat egg until very light. Add soda to buttermilk and stir into beaten egg. Add molasses and melted shortening. Sift in flour and salt. Beat. Fill small well-greased muffin tins with mixture and bake in 325° oven for 30 or 35 minutes.

Variations. Unsweetened: Certain diets require that sweetening be omitted. Chopped dates or raisins may be added instead.

Spiced: A dash of cinnamon and other spices add flavor.

Sweet milk: $\frac{1}{2}$ cup sweet milk and 2 tsp. baking powder may be used instead of buttermilk and soda. These muffins will have a distinct soy flavor.

DATE ALL-SOY MUFFINS

Follow above recipe adding $\frac{1}{4}$ cup or more of chopped dates. $\frac{1}{2}$ tsp. cinnamon may also be added. Figs, prunes, or raisins may be used instead of dates.

PANCAKES AND WAFFLES

The secret of light soy pancakes and waffles is to beat the eggs well. Soda and buttermilk or sour milk make tender light batter cakes with no taste of soy.

BUTTERMILK PANCAKES

1 cup soy flour	2 tbs. brown sugar (optional)
$\frac{1}{2}$ cup white or wheat flour	1 egg
1 tsp. soda	$1\frac{1}{2}$ cups buttermilk
$\frac{3}{4}$ tsp. salt	3 tbs. oil or melted shortening

Sift flours, soda, and salt. Beat egg well, add sugar, buttermilk, and sifted dry ingredients. Bake 1 tbs. of the mixture on a hot heavy griddle. Cook on one side, turn carefully, and brown other side. Serve with butter, honey, or sirup.

SWEET MILK PANCAKES

$\frac{1}{2}$ cup soy flour	$\frac{1}{2}$ tsp. salt
$1\frac{1}{2}$ cups white or whole-wheat flour	2 eggs
2 tsp. brown sugar	$1\frac{3}{4}$ cups milk
4 tsp. baking powder	2 tbs. oil or melted shortening

To the sifted dry ingredients, add the mixture of well-beaten eggs, milk, and shortening. Bake as small cakes on a hot griddle.

100 PER CENT SOY GRIDDLE CAKES

These can be used in place of meat, fish, or other protein.

2 eggs	1 tsp. soda
1 cup buttermilk	1 to $1\frac{1}{4}$ cups soy flour
$\frac{1}{2}$ tsp. salt	

Beat eggs well; add salt, buttermilk to which the soda has been added, and the sifted soy flour. The amount of flour depends on the size of the eggs and how thick you wish the batter. Bake on a hot heavy griddle with as little fat as possible. If sweetening is desired, add 1 tsp. sugar.

CORN MEAL AND SOY PANCAKES—WHEATLESS

1 cup soy flour	$\frac{3}{4}$ cups milk
1 cup yellow corn meal	2 eggs
$\frac{1}{2}$ tsp. salt	2 tbs. melted butter or oil
2 tsp. baking powder	

Beat eggs well, add milk, and sifted dry ingredients, and lastly add melted butter. Beat and bake on a heavy griddle.

SOY WHEAT WAFFLES

1 cup soy flour	2 eggs
1 cup white or whole-wheat pastry flour	2 cups milk
$\frac{3}{4}$ tsp. salt	3 tbs. melted butter or shortening
4 tsp. baking powder	

Beat eggs very light. Add milk and melted butter; sift in flours with salt and baking powder. Bake in a moderately hot

iron until golden brown. Makes 6 waffles. If sweetening is desired, add 1 tsp. or more of sugar or honey.

SOY WHEAT-GERM WAFFLES

Follow the above recipe, using $\frac{3}{4}$ cup white or whole-wheat pastry flour and $\frac{1}{4}$ cup wheat germ.

SOY BUTTERMILK WAFFLES

1 cup soy flour	2 tbs. sugar, white or brown
$\frac{2}{3}$ cup flour	5
1 tsp. soda	$\frac{1}{2}$ cups buttermilk
$\frac{3}{4}$ tsp. salt	4 tbs. oil or melted shortening

Sift flours, salt, and soda. Beat eggs until light, add sugar and buttermilk, and beat in sifted dry ingredients. Bake in medium-hot waffle iron until golden brown.

SOY CORN MEAL WAFFLES

2 eggs	1 cup soy flour
$1\frac{2}{3}$ cups milk	1 cup fine yellow corn meal
2 tsp. baking powder	4 tbs. oil or melted shortening
$\frac{1}{2}$ tsp. salt	Sweetening if desired

Beat eggs well, add milk and sifted dry ingredients. Add oil or melted shortening last. Beat well. Bake in medium-hot waffle iron. Delicious corn wafers can be made by pouring 1 tbs. of the batter in each section of the iron and baking until crisp. Butter and serve hot. If sweetening is desired, add 1 tsp. or more of sugar, honey, or molasses.

ALL-SOY WAFFLES I

2 eggs	1 tsp. soda
1 cup buttermilk	$1\frac{1}{4}$ cups soy flour
$\frac{1}{2}$ tsp. salt	4 tbs. melted shortening or oil

Beat eggs until thick and lemon-colored. Add salt, buttermilk with soda, soy flour, and oil or shortening. Bake in medium-hot waffle iron.

ALL-SOY WAFFLES II

2 cups soy flour	2 tbs. white or brown sugar
4 tsp. baking powder	3 eggs
$\frac{3}{4}$ tsp. salt	$1\frac{1}{2}$ cups milk
4 tbs. oil	

Sift flour 3 times; add baking powder and salt. Beat eggs well, add oil, sugar and milk, and fold in dry ingredients. Beat into a smooth batter. Bake in medium-hot waffle iron. For crisp waffles, be sure batter is thin.

SOY GLUTEN RECIPES

These are for starch-restricted diets and are unsweetened. A small amount of sweetening may be added if it can be tolerated. Recipes for soy gluten bread and biscuits will be found on page 259.

SOY GLUTEN MUFFINS

1 large egg	$\frac{1}{2}$ tsp. soda
$\frac{1}{4}$ tsp. salt	1 cup soy flour
$\frac{3}{4}$ cup buttermilk	$\frac{1}{4}$ cup gluten flour

Beat egg very light, add salt and then buttermilk, and sift in flour and soda. Mix well. Bake in 325° oven for 30 to 45 minutes.

SOY GLUTEN POPOVERS

A welcome change to the person who must have low-starch breads.

$\frac{3}{4}$ cup soy flour	$\frac{3}{4}$ cup milk
$\frac{1}{4}$ cup gluten flour	2 eggs
$\frac{1}{4}$ tsp. salt	

Sift flours into large mixing or beating bowl. Add salt, unbeaten eggs, and milk. Beat with electric beater for 5 minutes; longer by hand. The secret of light popovers is in the beating. Pour batter (it will be very thin) into well-oiled deep muffin tins or custard cups. Bake for 30 minutes in hot 450° oven. These can also be made using $\frac{1}{2}$ cup white or whole-wheat pastry flour and $\frac{1}{2}$ cup soy flour. Naturally, the starch content will not be so low as with the gluten flour.

SOY GLUTEN PANCAKES

2 eggs	$\frac{1}{4}$ cup gluten flour
$\frac{1}{2}$ tsp. salt	2 tsp. baking powder
4 tbs. melted butter or oil	About 1 cup milk
$\frac{3}{4}$ cup soy flour	

Beat eggs until light, add butter, and sift in dry ingredients. Thin with enough milk to make a pancake batter (about 1 cup). For waffles, make batter thicker than for pancakes.

SOY GLUTEN FRUIT DROPS

$\frac{3}{4}$ cup soy flour	1 egg
$\frac{1}{4}$ cup gluten flour	$\frac{1}{2}$ cup milk
2 tsp. baking powder	$\frac{1}{2}$ cup chopped raisins
$\frac{1}{2}$ tsp. salt	1 tsp. vanilla

Beat egg; add milk, raisins, and vanilla. Fold in sifted ingredients. Drop with teaspoon on well-oiled cookie sheet. Bake in moderate oven until brown.

BAKING-POWDER BISCUITS

$\frac{1}{2}$ cups flour	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup soy flour	4 tbs. shortening
4 tbs. baking powder	$\frac{3}{4}$ cup milk

Sift flour, baking powder, and salt, add shortening, and work it in with a fork until the flour is flaky. Make a well in the center of the flour and pour in the milk. Start in the center and stir with a fork until all the flour has been gathered in and it is a soft dough. Turn dough on floured board, roll lightly about 1 in. thick, cut with a small biscuit cutter, and bake 15 minutes in a 400° oven.

SHORTCAKE

Follow above recipe, adding 2 more tbs. of shortening. Work as for biscuits. Cut into small individual shortcakes or make one large shortcake. When baked, split so as to separate top and bottom. Spread with berries or any desired fruit and top with whipped cream.

WHOLE-WHEAT BISCUITS

$\frac{1}{2}$ cup soy flour	$\frac{1}{4}$ tsp. salt
$\frac{1}{2}$ cup whole-wheat pastry flour	2 tbs. shortening
2 tsp. baking powder	$\frac{1}{3}$ cup milk

Sift flours, salt, and baking powder. Cut in shortening. When mixture is the consistency of coarse corn meal, add milk. Spread dough on floured board and pat into sheet $\frac{1}{2}$ to 1 in. thick. Cut with small cutter and bake in 375° oven until brown. Whole-wheat biscuits will be hard and not so light as those made with white flour.

APPLE DUMPLINGS

1 cup flour	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup soy flour	6 tbs. butter or shortening
4 tsp. baking powder	$\frac{1}{2}$ cup milk

Sift flours, salt, and baking powder. Cut in shortening and add milk as for biscuits. Roll out about $\frac{1}{4}$ in. thick. Peel, core, and dice 3 apples. Cut dough into squares and place about half a diced apple in the square. Add a dash of cinnamon and 1 tsp. brown sugar. Fold the dough completely over the pieces of apple and press edges firmly together. Bake about 45 minutes in a 375 to 400° oven. Cool and serve with vanilla or custard sauce.

ALL-SOY SHORTCAKE

2 cups soy flour	6 tsp. baking powder
1 egg	2 tbs. brown or raw sugar
1 cup milk	1 tbs. melted butter or shortening
1 tsp. salt	1 tsp. vanilla or cinnamon

Beat egg; add sugar, salt, and a little milk. Then add alternately a little sifted flour and a little milk. After 1 cupful of milk has been added, stir in melted shortening. Continue adding flour and milk alternately. Save a little flour and mix the baking powder into it. Add this last. Bake in muffin tins in 350° oven about 40 minutes. Split muffins for shortcake. This dough may be baked in pie tin as one large shortcake.

PASTRY

SOY PIE CRUST

$\frac{1}{3}$ cup soy flour	5 tbs. shortening
$\frac{2}{3}$ cup flour	3 to 4 tbs. cold water
$\frac{1}{2}$ tsp. salt	

Sift flours and salt. Cut in shortening. Add enough water to make a smooth ball. Place on floured board and roll thin. Line pie plate with dough and bake in 400° oven until brown. Makes one pie shell.

SOY WHOLE-WHEAT PIECRUST

$\frac{1}{2}$ cup whole-wheat pastry flour	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup soy flour	4 tbs. cold water (approximately)
4 tbs. shortening	

Sift flours and salt and cut in shortening. When well blended, add cold water. Place dough on floured board and roll as thin as possible. Bake at 375° until brown.

TARTS

Follow either piecrust recipe. Roll thin and cut in fancy shapes. Add $\frac{1}{2}$ tsp. jam or jelly in center and bake in 375 to 400° oven until brown.

SOY CHEESE WAFERS

$\frac{1}{2}$ cup soy flour	1 tbs. milk
$\frac{1}{2}$ tsp. salt	1 oz. grated cheese
1 egg yolk, beaten	

Sift the flour and salt. Mix the beaten egg yolk with the milk and gradually add the liquid to the dry ingredients. Add the grated cheese and stir it evenly through the dough. Roll thin and cut into 2-in. squares. Bake in a moderate oven (350°) until brown. Sprinkle with salt as soon as they are removed from the oven.

COOKIES AND DOUGHNUTS

Soy flour may be used in any favorite cookie recipe to make an enriched or more nourishing cookie. The amount of soy flour

used will vary according to taste and recipe. Whole-wheat pastry flour may be used with the soy in practically all cookie recipes.

HEALTH COOKIES I

1 cup shortening	4 tbs. sour milk or buttermilk
1 cup brown sugar	$\frac{1}{4}$ tsp. salt
2 eggs	1 tsp. soda
3 cups oatmeal	$\frac{1}{2}$ tsp. cinnamon
1 cup white or whole-wheat pastry flour	1 cup chopped raisins or other dried fruit
1 cup soy flour	

Cream shortening and sugar, add beaten eggs, buttermilk, spices, and raisins. Add oatmeal and sifted flours with soda. Mix well. This will be a stiff dough. Drop with teaspoon on an oiled cookie sheet, flatten with a fork, and bake in 350° oven until brown.

HEALTH COOKIES II

5 tbs. shortening	1 tsp. cinnamon
5 tbs. brown sugar	$\frac{1}{2}$ cup raisins
$\frac{1}{2}$ cup molasses	1 tsp. grated orange rind
1 egg	$\frac{1}{2}$ tsp. nutmeg
$\frac{1}{2}$ cup whole-wheat flour	Dash of cloves
$\frac{1}{2}$ cup soy flour	$\frac{1}{2}$ tsp. salt
$1\frac{1}{2}$ cups quick-cooking oatmeal	$\frac{1}{4}$ tsp. soda
1 cup finely grated carrots	1 tsp. baking powder

Cream shortening and sugar. Add beaten egg, molasses, carrots, raisins, and orange rind. Sift dry ingredients and mix with oatmeal. Fold into molasses mixture. Mix well. Drop with teaspoon on well-greased cookie sheet and bake in 350° oven 15 minutes or more.

SOY DATE BARS

2 eggs	1 cup white or whole-wheat pas- try flour
1 cup brown or raw sugar	$\frac{1}{2}$ cup soy flour
4 tbs. boiling water	3 tsp. baking powder
1 cup chopped dates	$\frac{1}{2}$ tsp. salt
1 cup chopped walnuts	1 tsp. vanilla

Beat eggs, add sugar and water, and continue beating until lemon-colored. Add nuts, dates, and vanilla. Sift in flours, baking powder, and salt. Mix well. Bake in shallow well-oiled pan in 350° oven for about 35 minutes. Cut in squares or strips.

FIG ROCKS

1½ cups brown sugar	½ cup white or whole-wheat pas- try flour
1 cup shortening	1 cup soy flour
2 cups ground black figs	1 tsp. soda in ½ cup warm water
1 cup walnut meats (optional)	1 tsp. vanilla
3 eggs	

Beat eggs well; add to creamed shortening and sugar. Add ground fruit and mix well. Then add soda and water and last add flours. Drop with spoon on a buttered tin and bake in moderate oven until brown. 1 cup of raisins and 1 cup of figs may be used if desired.

FRUIT DROPS

1¼ cups soy flour	2 eggs
¼ cup white or whole-wheat pas- try flour	½ cup cream
3 tsp. baking powder	¼ cup honey
½ tsp. salt	1 cup chopped raisins or dates
	1 tsp. vanilla

Sift flour and baking powder several times. Beat eggs. Add honey, cream, and raisins. Fold in flour and mix well. Add a little more flour if necessary. Drop with spoon on oiled cookie sheet and bake in moderate oven until brown.

ALL-SOY FRUIT DROPS

1 cup dextrose	½ tsp. salt
½ cup shortening	½ cup water or milk
3 eggs	1 cup chopped dates
2 cups soy flour	1 cup chopped or ground figs
3 tsp. baking powder	2 tsp. vanilla

Cream shortening and dextrose; add beaten eggs and water. Sift flour, salt, and baking powder. Add fruit to mixture; then sifted dry ingredients. Mix well. Drop with a spoon on well-greased cookie sheet and bake in moderate oven about 15 minutes or until brown. These cookies will keep a long time.

SUGAR COOKIES

1 cup brown sugar	2 cups white or whole-wheat pas- try flour
$\frac{1}{2}$ cup shortening	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ cup milk	4 tsp. baking powder
1 egg, beaten	$\frac{1}{2}$ tsp. nutmeg
$\frac{1}{2}$ tsp. vanilla	$\frac{1}{2}$ tsp. salt

Cream the sugar and shortening. Add the beaten egg; then add alternately the milk and other ingredients sifted together. Roll to $\frac{1}{4}$ in. thickness on a floured board, sprinkle with white or brown sugar, and cut into cookies. Bake on an oiled cookie sheet in a 375° oven until brown. This amount makes 4 dozen cookies.

PEANUT-BUTTER COOKIES

$\frac{1}{2}$ cup oil or shortening	2 cups whole-wheat pastry flour
1 cup brown sugar	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ cup peanut butter	$\frac{1}{2}$ tsp. salt
2 eggs	$\frac{1}{4}$ cup water
4 tsp. baking powder	

Cream shortening, add sugar and beaten eggs. Add peanut butter, water, and dry ingredients. Mix well. Drop with teaspoon on oiled cookie sheet; flatten with a fork. Bake in 375° oven until brown.

SOY BUTTER COOKIES I

$\frac{1}{2}$ cup soybean butter (about $\frac{1}{4}$ lb.)	1 tsp. baking powder
$\frac{1}{4}$ cup shortening	$\frac{1}{2}$ tsp. soda
$\frac{1}{2}$ cup brown sugar	$\frac{1}{2}$ tsp. salt
1 egg	1 tsp. vanilla
4 tbs. milk	$\frac{1}{2}$ tsp. cinnamon
$\frac{1}{4}$ cup soy flour	1 tsp. nutmeg
$\frac{3}{4}$ cup white or whole-wheat pastry flour	

Cream soy butter and shortening; add sugar and beat until light. Add beaten egg and mix well. Sift dry ingredients and add to creamed mixture with milk. Chill dough. Roll out thin,

cut with round cutter, and bake cookies in moderate oven until brown.

SOY BUTTER COOKIES II

$\frac{1}{2}$ cup shortening	2 tsp. vanilla
$\frac{1}{2}$ cup toasted soy butter	$\frac{1}{2}$ tsp. soda
$\frac{1}{3}$ cup brown sugar	1 tsp. baking powder
$\frac{1}{4}$ cup corn sirup or honey	$\frac{1}{2}$ tsp. salt
$\frac{1}{2}$ cup buttermilk	1 cup soy flour
1 egg	1 cup flour

Cream shortening and soy butter, add sugar, sirup, beaten egg, vanilla, and buttermilk. Sift flour, salt, soda, and baking powder and fold into creamed mixture. Mix thoroughly. Chill. Shape dough into balls the size of a walnut and place on greased cookie sheet. Flatten with a fork. Bake in moderate oven until brown.

WHEAT-GERM WAFERS

$\frac{1}{2}$ cup oil or shortening	4 tbs. milk
1 cup sugar or raw sugar granules (Grans)	3 tsp. baking powder
1	$\frac{1}{2}$ cup white or whole wheat pas- try flour
2 tsp. vanilla	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ tsp. cinnamon	$\frac{1}{2}$ cup wheat germ
$\frac{1}{4}$ tsp. salt	

Pour oil over sugar and let stand a few minutes, or cream sugar and shortening. Add well-beaten egg, milk, and vanilla and fold in sifted flours with salt, cinnamon, and baking powder. Add wheat germ. Drop with teaspoon on well-oiled cookie sheet. If egg is large, the batter may be a little thin, and more wheat germ should be added. Bake in 375° oven until brown. A small amount of coconut meal is a good addition.

ICEBOX COOKIES

2 cups brown sugar	$\frac{1}{2}$ tsp. soda
$\frac{1}{2}$ cup shortening	$\frac{1}{2}$ tsp. vanilla
$\frac{1}{2}$ tsp. salt	3 cups flour
2 eggs	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ tsp. cream of tartar	$\frac{1}{2}$ cup nut meats

Beat eggs well; add to creamed sugar and shortening. Mix well. Add 1 cup flour with cream of tartar and salt. Moisten

soda with a little hot water; add with nuts and rest of flour. Knead dough if necessary. Shape into roll and chill in refrigerator for several hours. Slice into thin cookies and bake in 375° oven until brown.

WHEAT-GERM ICEBOX COOKIES

1½ cup shortening	3 tsp. baking powder
1 cup brown sugar	1½ cups white or whole-wheat pastry flour
1 egg	½ cup soy flour
3 tbs. milk or water	1 cup wheat germ
1 tsp. vanilla	
½ tsp. salt	

Cream shortening and sugar; add well-beaten egg, water or milk, salt, and wheat germ. Work in sifted flours and baking powder. This will make a stiff dough. Blend thoroughly, shape into a roll, wrap in wax paper, and chill in refrigerator overnight. Slice and bake in 375° oven until brown.

GROUND SOYBEAN WAFERS—FLOURLESS

2 eggs	1 tsp. vanilla
1 cup sugar or raw sugar crystals (Grans)	3 cups ground toasted soybeans

Beat eggs until thick and lemon-colored. Add sugar, vanilla, and ground toasted soybeans. Grind beans in food chopper, using fine knife. No salt is added because beans are salty. This will make a stiff dough. Drop teaspoonful on an oiled cookie sheet and pat to ¼ in. thickness with a fork dipped in water. Bake in 350° oven until brown. Remove at once from pan. These cookies are crisp and delicious and welcomed by those who should not have cereal starches.

SOY CRUNCH COOKIES

1 cup shortening	½ cup white or whole-wheat pas- try flour
1 cup brown sugar	4 tbs. sour milk or buttermilk
2 eggs	1 tsp. soda
2½ cups oatmeal	½ tsp. cinnamon
2 cups ground toasted soybeans	½ tsp. nutmeg

Cream shortening and sugar. Add beaten eggs, milk, and spices. Fold in sifted flour and soda. Add ground soybeans and oatmeal. Mix well. Drop with teaspoon on oiled cookie sheet; flatten with a fork dipped in cold water. Bake in 350° oven. These may be made without any flour, using 2½ cups of the ground soybeans. They are delicious but break very easily.

ROLLED WAFERS

7/8 cup brown sugar	1/2 tsp. vanilla
1 1/2 cup butter or shortening	3 tbs. soy flour
2 eggs	1/2 cup ground toasted soybeans
1/4 tsp. salt	

Cream shortening and sugar, add salt and vanilla, add eggs 1 at a time. Beat well. Fold in flour and soybeans. Drop with teaspoon on well-greased cookie sheet 2 in. apart. Bake in very slow oven (300°) until golden brown. Cool 3 or 4 minutes. Roll cookies on a small stick while still warm.

BRITTLE COOKIES

3/4 cup brown sugar	1/2 tsp. salt
1 1/4 tbs. butter or shortening	1/3 cup ground toasted soybeans
1 tbs. water	1/3 cup soy flour
1 tsp. cinnamon	

Mix sugar, shortening, water, and cinnamon together. Add flour and soybeans. Drop with spoon on well-greased sheet. Bake in 300° oven until brown. Remove at once from pan. May be rolled over stick if handled while warm.

ALL-SOY CHOCOLATE BROWNIES

1/4 cup shortening or butter	1/4 tsp. salt
1/2 cup brown sugar	1 tsp. baking powder
1/2 cup honey	1/2 cup soy flour
2 oz. chocolate	1 cup chopped nuts
2 eggs	

Cream shortening and butter; add melted chocolate and well-beaten eggs. Mix thoroughly. Add nuts, sifted flour, salt, and

baking powder. Spread in small, shallow, well-greased pan and bake in 325° oven for 25 minutes.

MOLASSES BROWNIES

$\frac{1}{2}$ cup shortening	$\frac{1}{2}$ cup white or whole-wheat pas- try flour
$\frac{1}{2}$ cup brown sugar	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ cup molasses	1 tsp. baking powder
2 oz. chocolate	$\frac{1}{4}$ tsp. salt
	1 cup chopped nuts

Cream shortening and sugar; add melted chocolate, molasses, and well-beaten egg. Sift in dry ingredients and add nuts last. Pour into well-oiled, shallow pan and bake in a slow oven 40 to 45 minutes.

MOLASSES NUT COOKIES—EGGLESS

$\frac{1}{2}$ cup shortening	$\frac{1}{2}$ tsp. nutmeg
$\frac{1}{4}$ cup boiling water	1 tsp. salt
$\frac{1}{2}$ cup brown sugar	$\frac{1}{2}$ cup nut meats
$\frac{1}{2}$ cup molasses	$1\frac{1}{2}$ cups white or whole-wheat pastry flour
1 tsp. soda	$1\frac{1}{2}$ cups soy flour
$\frac{1}{2}$ tsp. cinnamon	

Pour boiling water over shortening; add sugar, molasses mixed with soda, flour, spices, salt, and nuts. Shape dough into a roll, wrap in wax paper, and chill thoroughly. Slice and bake in 375° oven until brown.

MOLASSES DROP COOKIES

$\frac{1}{2}$ cup brown sugar	1 tsp. soda
$\frac{1}{2}$ cup shortening	1 tsp. cinnamon
$\frac{1}{2}$ cup molasses	$\frac{1}{2}$ tsp. ginger
$\frac{1}{2}$ cup buttermilk	cups soy flour
$\frac{1}{2}$ tsp. salt	cups flour

Cream shortening and sugar; add molasses and buttermilk. Fold in sifted dry ingredients. Mix well. Chill dough 3 or 4 hours. Drop with teaspoon on well-greased cookie sheet and bake in 350° oven until brown.

SOY GINGERSNAPS

1 cup shortening	1 tsp. soda
1 cup molasses	3 tsp. ginger
1 egg	1 cup soy flour
1 tsp. salt	3½ cups flour
½ tsp. lemon extract	

Melt shortening, mix with molasses and lemon extract. well-beaten egg and blend thoroughly. Sift dry ingredients together and fold into mixture. Chill dough until firm enough to roll. Roll thin, cut, and bake in 350 to 375° oven until brown.

SOY DOUGHNUTS I

4 tbs. shortening	½ tsp. cinnamon
1 cup sugar	1 tsp. vanilla
2 eggs	1 cup milk
1 tsp. salt	1 cup soy flour
4 tsp. baking powder	3 cups flour
1 rounded tsp. nutmeg	

Cream shortening and sugar. Beat in whole eggs. Sift dry ingredients together; add alternately with milk. Add vanilla. Roll dough on lightly floured board. Cut with doughnut cutter and fry in deep fat (365°) until golden brown. Drain on absorbent paper.

SOY DOUGHNUTS II

1 cup sugar	½ tsp. vanilla
1 cup buttermilk	3 tbs. melted butter or shortening
2 eggs	½ cup soy flour
¼ tsp salt	½ cup flour
½ tsp. soda	Enough flour to make soft dough
½ tsp. nutmeg	

Mix buttermilk and sugar and let stand 10 minutes. Add well-beaten eggs, and sifted dry ingredients. Add melted fat and vanilla and beat until smooth. Add enough flour to make a soft dough. Roll ½ in. thick, cut with doughnut cutter, and fry in deep fat.

CAKES

A small amount of soy flour can be added to many cake recipes with excellent results. It is especially fine in spice and fruit cakes.

SPICE CAKE

3 tbs. butter or shortening	4 tbs. molasses
1 cup brown sugar	1 tsp. soda
1 tsp. cinnamon	1 cup buttermilk or sour milk
1 tsp. ginger	1 $\frac{1}{4}$ cups white or whole-wheat
1 $\frac{1}{2}$ tsp. nutmeg	pastry flour
1 egg yolk	1 $\frac{1}{2}$ cup soy flour

Cream butter and sugar; add spices and egg yolk. Beat until creamy. Add molasses. Stir soda into buttermilk and pour into mixture. Fold in sifted flours. Mix well. Pour into oiled cake pan and bake in 350° oven for 35 minutes.

EGGLESS WHOLE-WHEAT SPICE CAKE

This is delicious, inexpensive, and fine for children's lunches.

1 cup shortening	2 cups whole-wheat pastry flour
2 cups brown sugar	1 tsp. soda
2 cups chopped dried fruit	1 tsp. salt
1 cup boiling water	1 tsp. cinnamon
1 cup buttermilk	1 tsp. nutmeg
1 cup soy flour	Dash of cloves and allspice

Mix shortening and sugar; add chopped fruit, then boiling water and buttermilk, and sift in dry ingredients. Beat well. Bake in low cake pan 45 minutes in a 325° oven. For small cake, cut recipe in half.

SOY CAKE

1 cup soy flour	$\frac{1}{3}$ cup milk
1 cup white or whole-wheat pas- try flour	4 tsp. baking powder
1 $\frac{1}{2}$ cup brown sugar	1 egg, well beaten
$\frac{1}{3}$ cup butter, melted	Dash of nutmeg and allspice

Cream sugar and butter; add beaten egg. Fold in sifted dry ingredients alternately with milk. Pour into buttered baking

pan or layer tins and bake in moderate oven (350°) 35 to 40 minutes.

DEVIL'S FOOD CAKE I

$\frac{1}{2}$ cup shortening	$\frac{1}{2}$ cup soy flour
$1\frac{1}{4}$ cups brown sugar	1 tsp. soda
2 eggs, well beaten	1 tsp. baking powder
$\frac{1}{2}$ cup boiling water	$\frac{1}{2}$ tsp. salt
2 oz. chocolate	$\frac{1}{2}$ cup sour milk or buttermilk
1 cup flour	1 tsp. vanilla

Pour boiling water over chocolate; stir over a low flame until smooth. Cool. Cream sugar and shortening thoroughly. Add the beaten eggs and beat well. Add chocolate, milk, and vanilla. Fold in the sifted dry ingredients and beat until very smooth. Turn into layer-cake pans or a shallow cake pan and bake for 25 minutes in a 365° oven. This cake may be made with whole-wheat pastry flour.

DEVIL'S FOOD CAKE II

cups brown sugar	$\frac{1}{2}$ tsp. soda
$\frac{1}{2}$ cup shortening	2 tsp. vanilla
$\frac{1}{2}$ tsp. salt	1 cup white or whole-wheat pas- try flour
3 oz. chocolate	$\frac{1}{2}$ cup soy flour
$\frac{1}{2}$ cup sour milk	
3 eggs	

Cream shortening and sugar, add beaten yolks, melted chocolate, milk and vanilla, then sifted flour, salt, and soda. Fold in stiffly beaten egg whites. Bake in layer tins in 350° oven 30 minutes. Makes 2 layers.

FRUIT CAKE

$\frac{1}{4}$ lb. butter or shortening	1 cup chopped walnuts
$\frac{1}{2}$ cup honey	$\frac{1}{4}$ lb. citron peel
3 eggs	$\frac{1}{4}$ lb. orange peel
$\frac{1}{2}$ cup white or whole-wheat pas- try flour	$\frac{1}{4}$ lb. raisins
$\frac{1}{2}$ cup soy flour	$\frac{1}{2}$ lb. pineapple and cherries
$\frac{1}{2}$ tsp. salt	$\frac{1}{2}$ tsp. cinnamon
2 tsp. baking powder	$\frac{1}{2}$ tsp. nutmeg
$\frac{1}{2}$ cup grape juice	Dash allspice and cloves

Cut fruit, mix, and place in bowl. Cover with grape juice, to which the spices have been added, and let stand overnight. Cream butter, add honey, then beaten eggs and soaked fruit, last fold in flour sifted several times with baking powder and salt. Mix well and pour in buttered loaf pan. Bake $1\frac{1}{4}$ to $1\frac{1}{2}$ hours in 325° oven.

APPLESAUCE CAKE

- | | |
|--|--|
| 1 cup shortening | 1 tsp. nutmeg |
| 2 cups brown sugar | 1 cup soy flour |
| 2 eggs | $2\frac{1}{2}$ cups whole-wheat pastry flour |
| $1\frac{1}{2}$ cups thick unsweetened applesauce | 1 tsp. salt |
| 1 tsp. cinnamon | $3\frac{1}{3}$ tsp. baking powder |
| | $\frac{3}{4}$ tsp. soda |

Cream shortening and sugar. Add the beaten egg, applesauce, nutmeg, and cinnamon. Sift the dry ingredients and stir into sugar mixture. Bake in shallow loaf or deep layer cake tin for 40 to 50 minutes in moderate oven (350°). For small cake, cut recipe in half.

"SALTED SOYBEAN" CAKE

- | | |
|-------------------------------|-------------------------------|
| 1 cup brown sugar | 1 cup buttermilk or sour milk |
| $\frac{1}{2}$ cup shortening | 1 well-beaten egg |
| 1 cup ground toasted soybeans | cups white or whole-wheat |
| 1 tsp. soda | pastry flour |
| 1 tsp. vanilla | |

Grind toasted soybeans in food chopper, using fine knife. Cream sugar and shortening; add beaten egg and vanilla. Sift soda and flours and add alternately with buttermilk. Fold in ground soybeans last. Pour into well-oiled cake pan and bake in 350° oven about 30 minutes. For variations, add 1 tsp. cinnamon and $\frac{1}{2}$ tsp. nutmeg. 1 cup flour and $\frac{1}{2}$ cup soy flour may be used if desired. This cake may be made with ground salted peanuts instead of soybeans.

GOLD LAYER CAKE

- | | |
|------------------------------|----------------------------------|
| $\frac{1}{2}$ cup shortening | 1 tsp. lemon extract |
| 1 cup sugar | $\frac{3}{4}$ cup milk |
| 4 egg yolks | $\frac{1}{4}$ cup soy flour |
| 2 tsp. baking powder | $1\frac{3}{4}$ cups pastry flour |
| $\frac{1}{4}$ tsp. salt | |

Cream shortening and sugar. Beat egg yolks until thick and lemon-colored. Add to cream mixture and blend thoroughly. Add lemon extract. Sift dry ingredients several times; add alternately with milk. Pour batter into 2 well-greased layer-cake pans and bake in 350° oven for 30 minutes. Frost with desired frosting.

ORANGE LAYER CAKE

$\frac{1}{2}$ cup shortening	$\frac{1}{3}$ cup orange juice
$\frac{3}{4}$ cup sugar	1 tsp. grated orange rind
2 eggs	$\frac{1}{2}$ tsp. orange extract
$\frac{1}{2}$ tsp. salt	$\frac{1}{4}$ cup soy flour
2 tsp. baking powder	cups pastry flour
$\frac{1}{3}$ cup milk	

Cream sugar and shortening. Add well-beaten egg yolks, orange rind, and extract, and mix thoroughly. Sift dry ingredients several times and add alternately with milk. Add orange juice. Beat egg whites until stiff and fold carefully into batter. Bake in 2 well-greased layer-cake pans in 350° oven 30 minutes. Cool. Put together with desired filling and frost with orange icing.

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